Proposed Montco Mine, Rosebud County, Montana

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Environmental Impact
Statement OSM-EIS-14

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United States Department of the Interior

OFFICE OF SURFACE MINING
Reclamation and Enforcement
WASHINGTON, D.C. 20240

FEB 8 1984

To: Reviewers

From: Acting Chief, Division of Environmental and Economic Analysis

Subject: Review of Draft Environmental Impact Statement OSM-EIS-14

The attached draft environmental impact statement (EIS) has been prepared by the Office of Surface Mining (OSM) and is available for public review and comment. This EIS analyzes the impacts on the human environment that would result from concurrence by OSM with the decision of the Montana Department of State Lands (DSL) on the permit application of Montco for its proposed mine in Rosebud County, Montana. OSM concurrence in the DSL decison is required by the Montana State - Federal cooperative agreement. OSM will accept written comments on this EIS and conduct a public hearing.

The comment period for this EIS will extend until 5:00 p.m. (eastern time) on April 9, 1984. Written comments should be hand-delivered or mailed to the following address:

Office of Surface Mining,
Division of Environmental and Economic Analysis,
Attn: A. M. Orellana,
Interior South Building, Room 134,
1951 Constitution Ave., NW.,
Washington, DC 20240.

Written comments should be as specific as possible. OSM appreciates all comments, but those most useful and likely to influence decisions in the preparation of the final EIS are those which provide facts and analyses to support any recommendations or conclusions. OSM cannot assure that written comments will be considered or included in the preparation of the final EIS if they are received after the close of the comment period or at locations other than the address given above.

A public hearing on the EIS will be held on March 20, 1984, at 7:00 p.m., in the multipurpose room of the Ashland Elementary School, Ashland, Montana.

Filing of a written statement by commenters at the time of the hearing is requested and will greatly assist the transcriber. Submission of written statements in advance of the hearing will allow OSM officials to prepare appropriate questions. The public hearing will continue on the specified date until all persons who are present in the audience and wish to comment have been heard.

For further information and additional copies of this draft EIS, contact:

Ms. Anna May Orellana, Project Leader, at the above address or by telephone (202-343-5854).

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Proposed Montco Mine, Rosebud County, Montana

Draft Environmental Impact Statement
OSM-EIS-14

February 1984

Type of Action: Administrative

Prepared by
Office of Surface Mining Reclamation and Enforcement
Washington, D.C.

James R. Harris

Director

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COVER SHEET

Lead agency:

Office of Surface Mining, Reclamation and Enforcement (OSM),
U.S. Department of the Interior.

Proposed action:

Concurrence with Montana State decision on the permit application submitted by Montco for the Montco mine.

For additional information or for copies of this EIS, please contact:

Anna May Orellana
Division of Environmental and Economic Analysis
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Type of statement:

Draft environmental impact statement.

Abstract:

Montco proposes to open a surface coal mine in the Tongue River valley near Ashland, Montana. Mining in the proposed permit area would produce 25.5 million tons of coal from about 500 acres, reaching a maximum production level of 6 million tons per year. The mine would produce 186 million tons of coal from about 5,000 acres over its anticipated 24-year life, reaching a maximum production level of 12 million tons of coal per year. The coal would be shipped via a proposed new railroad line along the Tongue River. The mine would cause moderately significant social, fiscal, and esthetic impacts during its life. Impacts on other resources would not be significant, in that the capacity of those resources to meet anticipated uses would largely be maintained during mining or would be restored by reclamation.

Note.--Please retain your copy of this draft EIS. If changes to the EIS in response to comments are minor, OSM will circulate only the comments, responses, and changes as the final EIS. Copies of the final EIS will be sent only to those agencies and organizations listed in chapter V, to those who comment on this draft EIS, and to those who specifically request a copy of the final EIS.

PREFACE

This environmental impact statement (EIS) analyzes the impacts on the human environment that would result from concurrence by the U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSM), with the decision of the Montana Department of State Lands (DSL) on the permit application of Montco for its proposed mine in Rosebud County, Montana. OSM concurrence in the DSL decision is required by Article V.B.8. of the Montana State-Federal Cooperative Agreement (46 F.R. 20993, April 8, 1981). Much of the information in this EIS is similar to that contained in the draft EIS prepared by DSL in May 1982 on the proposed Montco mine.

This EIS consists of seven chapters. Chapter I describes the proposed action, and the purpose of and need for the action, and provides background information. Chapter II describes and compares the alternatives evaluated in this EIS for the decisionmaker and the public. The alternatives include: alternative A, no action; alternative B, concurrence with the DSL decision; alternative C, concurrence with the DSL decision with additional conditions (stipulations); and alternative D, withhold concurrence with the DSL decision. Alternative B is the OSM preferred alternative.

Chapter III describes the existing environment that would be affected by the proposed action.

Chapter IV describes and analyzes the environmental impacts that would result from the proposed action. The analysis considers the permit application with revisions as of January 1, 1984.

Chapter V describes the consultation and coordination with the public and other agencies that occurred during the preparation of this EIS and lists those from whom comments are being solicited. Chapter VI lists, with their qualifications, the individuals who prepared the environmental analyses and prepared this document. References cited in this document are listed in Chapter VII.

SUMMARY

This environmental impact statement (EIS) analyzes the impact on the human environment that would result from concurrence by the Office of Surface Mining Reclamation and Enforcement (OSM) with the decision of the Montana Department of State Lands (DSL) on the permit application of Montco for the proposed Montco mine in Rosebud County, Montana. The analysis was prepared by an interdisciplinary team from OSM with input from DSL. Concurrent with this EIS, DSL is preparing a corresponding EIS under the Montana Environmental Policy Act. OSM and DSL are cooperating to the fullest extent possible in the preparation of these separate EIS's.

Brief Description of the Company's Proposal. Montco proposes to open a surface coal mine in the Tongue River valley near Ashland, Montana. Montco would mine at a maximum rate of 6 million tons per year from about 500 acres in the proposed permit area. Annual production would reach 12 million tons by about 2000, and would employ about 560 workers. About 5,000 acres would be mined over its 24-year life. The coal would be shipped via a new rail line that would connect with the Burlington Northern mainline along the Yellowstone.

Summary of Impacts

Geology. Adequate favorable overburden exists in the North King mining unit to cover the spoils to the required depth of 8 feet. This would be adequate for successful reclamation; however, separation of favorable from unfavorable material would require special overburden handling and storage techniques. In the life-of-mine area some mining units apparently have sufficient favorable overburden to provide for successful revegetation. Available data indicate, however, that two of the proposed units may lack sufficient favorable overburden to provide for an adequate cover over toxic spoils. Further testing is needed to establish the presence or absence of adequate quantities of favorable overburden in these units. If the needed favorable overburden is not present, under present regulations mining of these units would not be permitted.

No serious adverse impacts would occur in the life-of-mine area due to the character of the overburden as mining would not take place unless adequate favorable overburden is present.

Following reclamation, some erosion of soil would be unavoidable.

Hydrology. The mine would increase somewhat the total dissolved solids (TDS) in ground and surface waters of the life-of-mine area. Postmining uses of the land would not be adversely affected by these changes. TDS would eventually contribute to dissolved solids loads in the Tongue River, although the increased loads would be negligible and would not adversely affect agricultural water uses downstream. The mine could cause occasional minor increases in sedimentation in the Tongue River and its tributaries.

Soils. Some impacts on soils would be unavoidable, including loss of soil profile, structure, and organic matter. These impacts would make the area more sensitive to mismanagement and drought than prior to disturbance. However, the proposed plan calls for salvaging only favorable soil, and this should enhance the revegetation effort.

Vegetation. Preservation of topsoil and identification, removal, storage and replacement of favorable overburden should lead to successful revegetation.

Aquatic Biology. Aquatic habitats within the North King mining unit are restricted to several springs and stock ponds. These would be removed without detrimental effects to regional aquatic ecosystems. Degradation of water quality or aquatic populations in the Tongue River is anticipated to be minor.

Wildlife. Wildlife habitat in the areas being mined would be temporarily destroyed. Habitat-type changes would result over the short term in a loss of coniferous cover for big game species. Additional hunting would result, but this should not be detrimental to wildlife populations.

Climate. Climate would not be affected.

Air Quality. Total suspended particulate (TSP) concentrations would increase substantially in Ashland and near the proposed permit area. The major source of these particulates would be traffic on FAS 566. The area affected would be localized along FAS 566. The impacts would be moderate.

Economic Conditions. Powder River County would experience moderately significant fiscal impacts and would have to raise its tax rate substantially to pay for needed services attributable to the mine. Montco would contribute substantial State and Federal revenues and would increase employment and income in the local area.

Social Conditions. Moderately significant impacts on social conditions would occur in the Ashland area. Changes in social organization could be detrimental to some residents, especially those with long-standing ties to the Ashland-Birney area.

Community Services. Population increases would strain some services and facilities in Rosebud and Powder River Counties. The impact would be moderate to potentially significant because the affected communities could receive assistance from the Montana Coal Board to meet anticipated demands.

Land Use. The mine would not greatly affect the pattern of land uses in the region. Following reclamation, the mined area would support anticipated postmining uses for agriculture about as well as at present.

Transportation. Road and rail traffic from the Montco mine would not exceed the capacities of the existing transportation system, nor would it create significant safety problems.

Recreation. The mine would probably cause some overuse of recreation facilities in Ashland, but these could be expanded to accommodate increased use. Recreational conflicts over the use of public and private lands would increase, but could be alleviated by improved landowner-sportsmen cooperation.

Cultural Resources. Eleven prehistoric sites eligible for National Register listing would be lost due to mining; however, the impacts to cultural resources would not be significant because the information they contained would be recovered before they were mined.

Esthetics. Visual impacts would be moderately significant during mining, but following reclamation, the mined area could not be easily distinguished from surrounding unmined land. Noise from the mine would not be disruptive because few people live near the mine.

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CHAPTER I

INTRODUCTION

A. PROPOSED FEDERAL ACTION

The U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSM), proposes to concur with a decision of the Montana Department of State Lands (DSL) on a permit for the Montco mine in Rosebud County, Montana. This action is required under section 523 of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and the terms of the Montana State-Federal Cooperative Agreement (46 FR 20983) for surface mining and reclamation operations on Federal lands.

Montco, a Montana partnership of Thermal Energy, Inc., and Tongue River Resources, Inc., proposes to open a new surface coal mine in the Tongue River Valley in Rosebud County, Montana (figure I-1). The mine would produce 186.1 million tons of coal over 24 years at a maximum rate of 12 million tons per year.

Montco has applied to DSL for a surface mining permit. The proposed permit would allow Montco to construct and operate the initial mining and facilities areas. Additional permits would be required for the remainder of the 24-year life-of-mine area. Figure I-2 shows the life-of-mine area, which includes the "permit area" covered by the current application and the additional mining units planned for the life of the mine. Figure I-3 shows the permit area mine plan.

B. PURPOSE OF AND NEED FOR ACTION

The permit application submitted by Montco proposes to construct mining-related facilities on approximately 213 acres of private land surface overlying unleased Federal coal. As defined in section 701(4) of SMCRA, this area is considered "Federal lands." Therefore, under section 523 of SMCRA and Article V.B.8. of the Montana State-Federal Cooperative Agreement for surface mining and reclamation operations on Federal lands, OSM concurrence with the State decision on the permit application is required.

OSM has reviewed the Montco permit application and has determined that its decision on concurrence would constitute a major Federal action significantly affecting the quality of the human environment under section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.). OSM is preparing this EIS in compliance with NEPA and the regulations of the Council on Environmental Quality (40 CFR 1500 et seq.) at the same time that the State is preparing a similar EIS in accordance with the Montana Environmental Policy Act (MEPA). OSM and the State are proceeding independently in preparing these EIS's because the State had partially completed its EIS process before OSM determined that an EIS in compliance with NEPA was required. In view of this circumstance, OSM has determined that the most effective way to meet its responsibilities under NEPA is to cooperate with the State to the fullest extent possible in the preparation of separate EIS's.

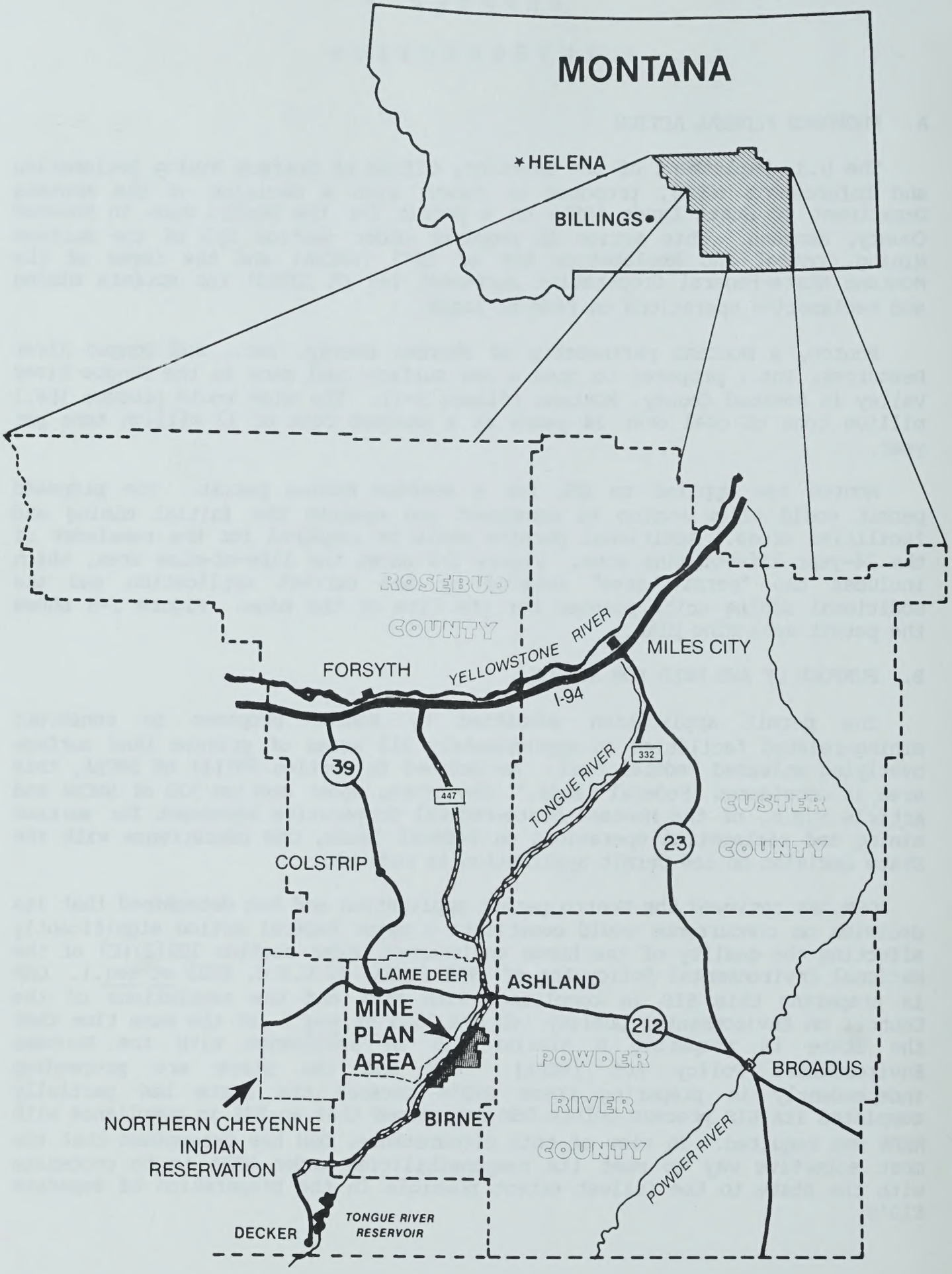

Figure I-1.--Location of the Montco mine.

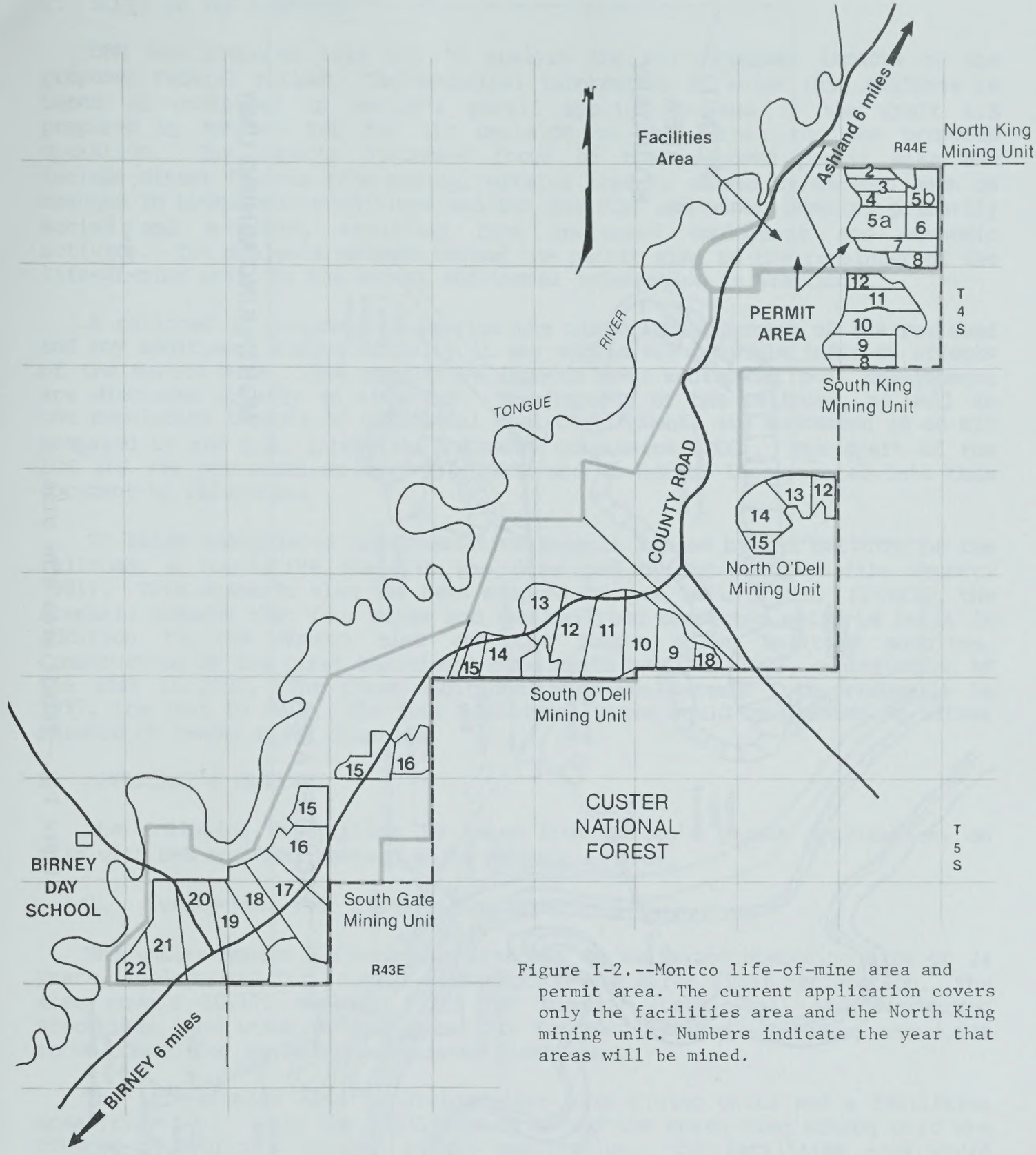

Figure I-2.--Montco life-of-mine area and permit area. The current application covers only the facilities area and the North King mining unit. Numbers indicate the year that areas will be mined.

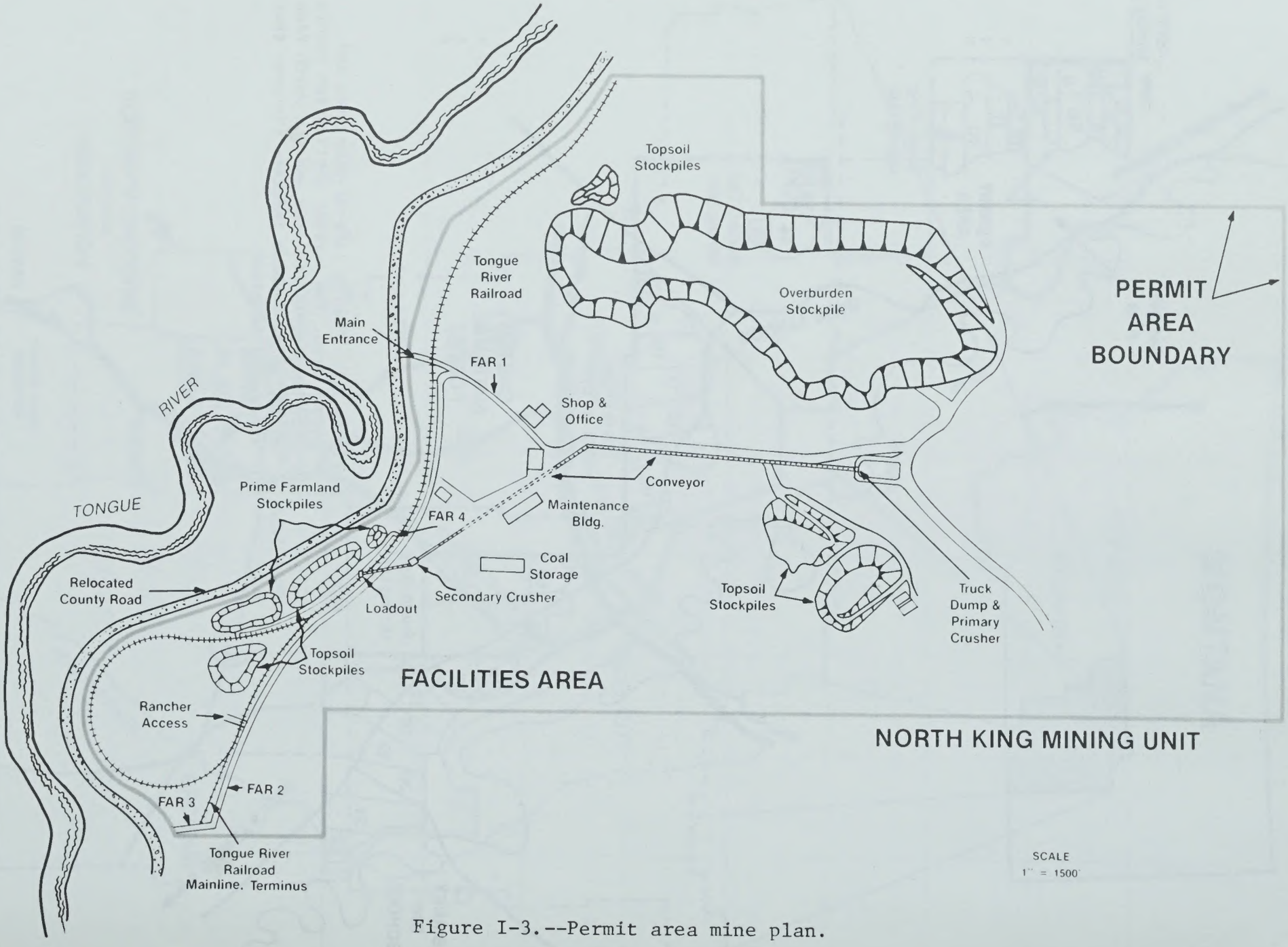

Figure I-3.--Permit area mine plan.

C. SCOPE OF THE ANALYSIS

OSM has prepared this EIS to analyze the environmental impacts of the proposed Federal action. The technical information on which this analysis is based is contained in Montco's permit application and in the draft EIS prepared by Montana DSL for its decision on the permit for the proposed operation. The impacts discussed focus on the proposed permit area and include direct impacts from mining, offsite impacts caused by mining, such as changes in hydrologic conditions and air quality, and other impacts, primarily social and economic, resulting from increased employment and economic activity. The analysis extends beyond the permit area to the remainder of the life-of-mine area, to the extent additional information is available.

A railroad is proposed to service the mine. Construction of the railroad and any additional mining activity it may enable are possible indirect effects of the Montco mine. The cumulative impacts from additional coal development are discussed briefly in this EIS. The impacts of the railroad, as well as the cumulative impacts of additional coal development, are addressed in an EIS prepared by the U.S. Interstate Commerce Commission (ICC). The draft of the ICC EIS was published on July 15, 1983, and is hereby incorporated into this document by reference.

To guide analysis of the cumulative impacts caused by the building of the railroad, a cumulative scenario was developed by DSL (DSL on-file report, 1981). This scenario also has been adopted for use in this EIS. Briefly, the scenario assumes that four mines and one railroad connector would be built in addition to the Montco mine and the Tongue River Railroad mainline. Construction of the first additional mine would begin in 1987, construction of the last in 2002. The first additional mine would reach full production in 1997, the last in 2010. The four additional mines would be located in either Rosebud or Powder River Counties.

D. APPLICANT'S PROPOSAL

The following description is taken from Montco's permit application, on file with DSL and OSM, revised as of January 4, 1984.

1. Twenty-Four-Year Life-of-Mine Area

The entire Montco life-of-mine area has an estimated operating life of 24 years, including 2 for initial construction and 2 for final reclamation. The area covers 10,171 acres; 5,322 for mining, roads, soil and overburden stockpiles, and other disturbances; 218 for facilities disturbance; and 4,631 to be bonded for unplanned associated disturbance.

The life-of-mine area is divided into five mining units and a facilities area (fig. I-2). Only the facilities area and the North King mining unit are covered by Montco's current permit application. The facilities area would handle all coal produced during the life of the mine. The North King unit

would be reclaimed beginning in year 6, and ending in year 11. Active mining would continue into the South King unit, starting in year 9. Montco's design of the life-of-mine area outside the North King mining unit, for operations starting in year 9, is now conceptual.

a. Mining units--general

Within each of the five mining units, all topsoil would be removed, stockpiled, and replaced in two lifts, primarily with scrapers, but also with dozers and excavators if appropriate. Shovels and trucks--and dozers, excavators, and scrapers where appropriate--would remove and replace overburden. A small dragline may be used for removal of the thick interburden between the Middle/Lower Knobloch and the Nance coal seams. Some topsoil and overburden would be removed and replaced by direct backhaul; the remainder would be stockpiled until replaced. All stockpiles would be located within the mining unit from which they originated. All topsoil stockpiles would be stabilized with a cover crop, mulch, or perennial grass cover.

Shovels would excavate coal, except where dozers, scrapers, or excavators were better suited. The coal would be transported by bottom-dump coal-haulers from the active coal face to a truck dump/primary crusher located at the edge of the mining area within each mining unit. An overload conveyor would transport coal to a secondary crusher in the facilities area. The conveyor would be moved and extended to reach each new area mined.

b. Facilities area

From the secondary crusher in the facilities area, coal would be conveyed to either the train loadout, for direct loading into unit trains, or to the storage building. When needed, coal from the storage facility would be conveyed back to the secondary crusher and from there conveyed to the train loadout.

The following would remain in the facilities area for the life of the mine: the rail loop; roads FAR1, FAR2, FAR3, and FAR4; the rancher access road to the interior of the rail loop; and stockpiles of topsoil removed from the facilities area. (See fig. I-3.) Maintenance and employee facilities within the shop and office complex would support operations throughout the life of the mine. A small maintenance and employee facility may be built later to help support operations in the last two (southernmost) mining units. Power for mining oerations would be supplied by a 69-kilovolt powerline built from Ashland to the facilities area. The facilities area, including the rail loop, would be reclaimed after all mining ended.

c. Tongue River Railroad

The Tongue River Railroad Company proposes to build a mainline to and through a point 0.6 miles south of Montco's proposed permit area to transport coal from the mine. Montco plans to construct a spur and loop 19,677 feet in length. Of this, 14,899 feet would parallel the Tongue River Railroad

mainline and lie within the Tongue River Railroad corridor. Locating the Montco siding in the same corridor as the mainline would minimize the amount of land disturbed. The railroad to Montco would be completed in 1985; a connector to the second terminal point, Otter Creek, would be constructed between 1986 and 1987.

The Tongue River Railroad Company may extend the mainline south of the currently proposed terminus. Montco would implement one of the two following plans, depending on whether or not the mainline is extended.

Plan 1: The Tongue River Railroad is extended through the permit area during the life of the Montco mine.

If the railroad were extended through the permit area, Montco would apply for bond release on the part of the mainline corridor east of the Montco siding and loop. Later, when the Montco mining is completed, Montco would remove its track and ties from the western part of the mainline corridor and apply for bond release on that area. Because the mainline would remain after mining, Montco proposes that stabilized cuts and fills not be redistributed after mining ends. Instead, Montco would request bond release on the corridor under the alternative reclamation provisions of the regulations governing mining. Final reclamation of the mainline would be regulated by the Interstate Commerce Commission.

Plan 2: The Tongue River Railroad does not extend through the permit area during the life of the Montco mine.

Montco would remove the tracks and ties from its siding and loop and convert the corridor to a road suitable for county use. This would allow the road that was relocated during mining to be moved back into the transportation corridor during reclamation. Montco would apply for bond release under the alternative reclamation provisions of the regulations governing mining.

2. North King Mining Unit

The North King unit (fig. I-3), would be mined using a truck-shovel method. Construction was originally proposed to begin in mid-1982 (mine year 1), with initial production scheduled for mid-1984 (mine year 3). The schedule would not be met, owing to delays that have already occurred.

The 5-year permit area is made up of two subareas: the facilties area and the North King mining unit. The estimated life of the facilities area is 22 years, that of the North King mining unit, 11 years. A total of 1,274 acres are associated with the current permit application area. (See table I-1.) Table I-2 shows the acreage to be disturbed each year within the North King mining unit. Years 6 through 24 would be covered in subsequent 5-year permits. Coal production in the North King mining unit would begin in year 3, peak at 6 million tons per year in year 6, and end after a total yield of 25 million tons.

Table I-1.--Area affected by permit application

Disturbance	Bonding level	Acres
North King mining unit	Mining	502
Facilities area*	Facilities	169
Remainder of permit area (minor disturbances only)	Associated	603
Permit area total		1,274

*To remain bonded throughout the life of the mine.

Table I-2.--Acreage disturbance and coal production from the North King mining unit

Year	Coal production (millions of tons)	Facilities	Mining related	Reclamation
1 & 2	0	169	70	0
3	1	0	47	0
4	2	0	58	0
5a	2	0	71	0
5b	2	0	65	0
6	6	0	66	0
7	6	0	65	149.8
8	6	0	54	123.6
9	0	0	6	21.3
10	0	0	0	191.4
11-15	0	0	0	33.5
22-24	0	0	0	110.4
Total	25	169	502	630*

*The transportation corridor (41 acres) would not be reclaimed. Thus, total reclamation would be 630 acres (128+502) rather than 671 acres (169+502).

To begin mining, an initial truck and shovel pit would be developed in the northwest corner of section 9, T. 4 S., R. 44 E (fig. I-2). Mining would progress southward with (1) topsoil and overburden stockpiling, (2) coal removal, and (3) direct backhaul of overburden and topsoil over each excavated area. (See fig. I-4.) Backfill would begin in year 4.

The area backfilled during years 4 and 5 would be used for overburden stockpiling. Backfilling via direct backhaul would continue until year 8. The final pit would be backfilled from the overburden stockpiles in years 9 and 10. Revegetation of the backfilled area would begin in year 6 and continue through year 11. Reclamation of other disturbances within the North King mining unit, except postmining sediment ponds, would be completed in year 11. Reclamation of the facilities area would begin after completion of mining of the entire life-of-mine area and would require 1 to 2 years to complete.

DSL regulations require that during mining all disturbed surface drainage be passed through sediment ponds before leaving the permit area. Figure I-5 shows Montco's planned diversion and collection ditches and sediment ponds. Additional surface drainage control plans have also been submitted by Montco as part of its reclamation plan.

3. Coal in the North King Mining Unit

Montco plans to mine the two major coal seams that underlie the North King mining unit, the middle Knobloch (MK) and McKelvey (MLV). The McKelvey splits into two seams, the MLV and ML1, in the southern part of the unit. Three local seams, the LF1, LF2, and LF3, and another seam 350 to 400 feet deep, would not be mined because of their depth, thinness, and limited area. (See chapter II, Geology.)

Table I-3 shows the amount of coal within the North King mining unit. About 71 percent of this would be recovered; 4 percent is uneconomic; 10 percent would be lost to waste and spillage; 9.5 percent would be lost under the highwall; and 5.5 percent would be lost due to regulatory constraints, such as buffer zones along boundaries.

The coal to be mined in the North King mining unit would average, as received at the powerplant, 8,655 Btu, 27 percent moisture, 6.98 percent ash, and 0.34 percent sulfur. This is typical of Northern Powder River Basin coal and suitable for use in coal-fired electric generating plants. The company's coal marketing efforts are focused on utilities in the upper Midwest and the Pacific Northwest.

Burlington Northern, Inc., leases to Montco all coal to be mined in the North King mining unit. Montco would disturb some land overlying uneconomical Federal coal which would not be mined. Figure I-6 shows coal ownership within the proposed permit area; figure I-7 shows surface ownership.

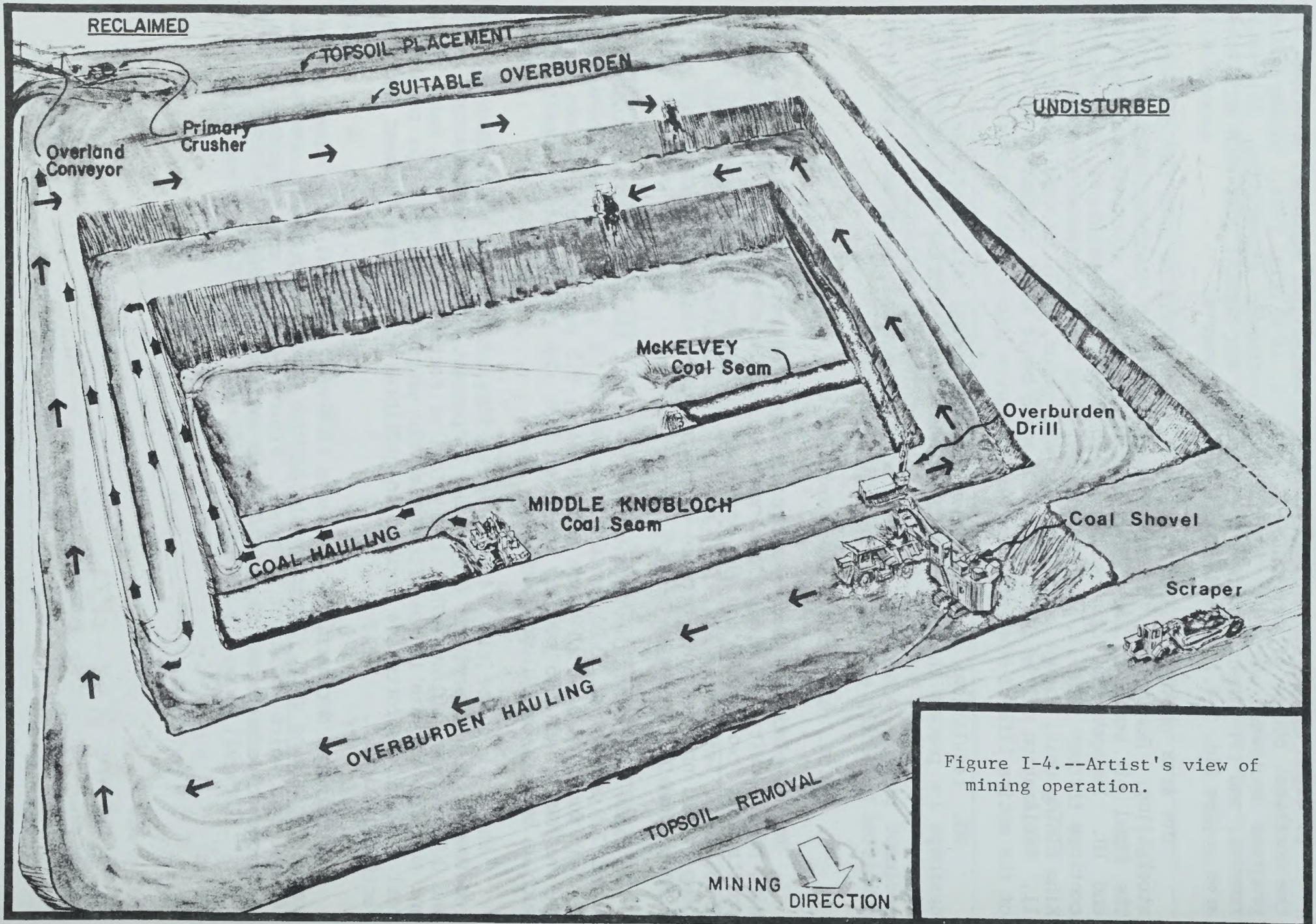

Figure I-4.--Artist's view of mining operation.

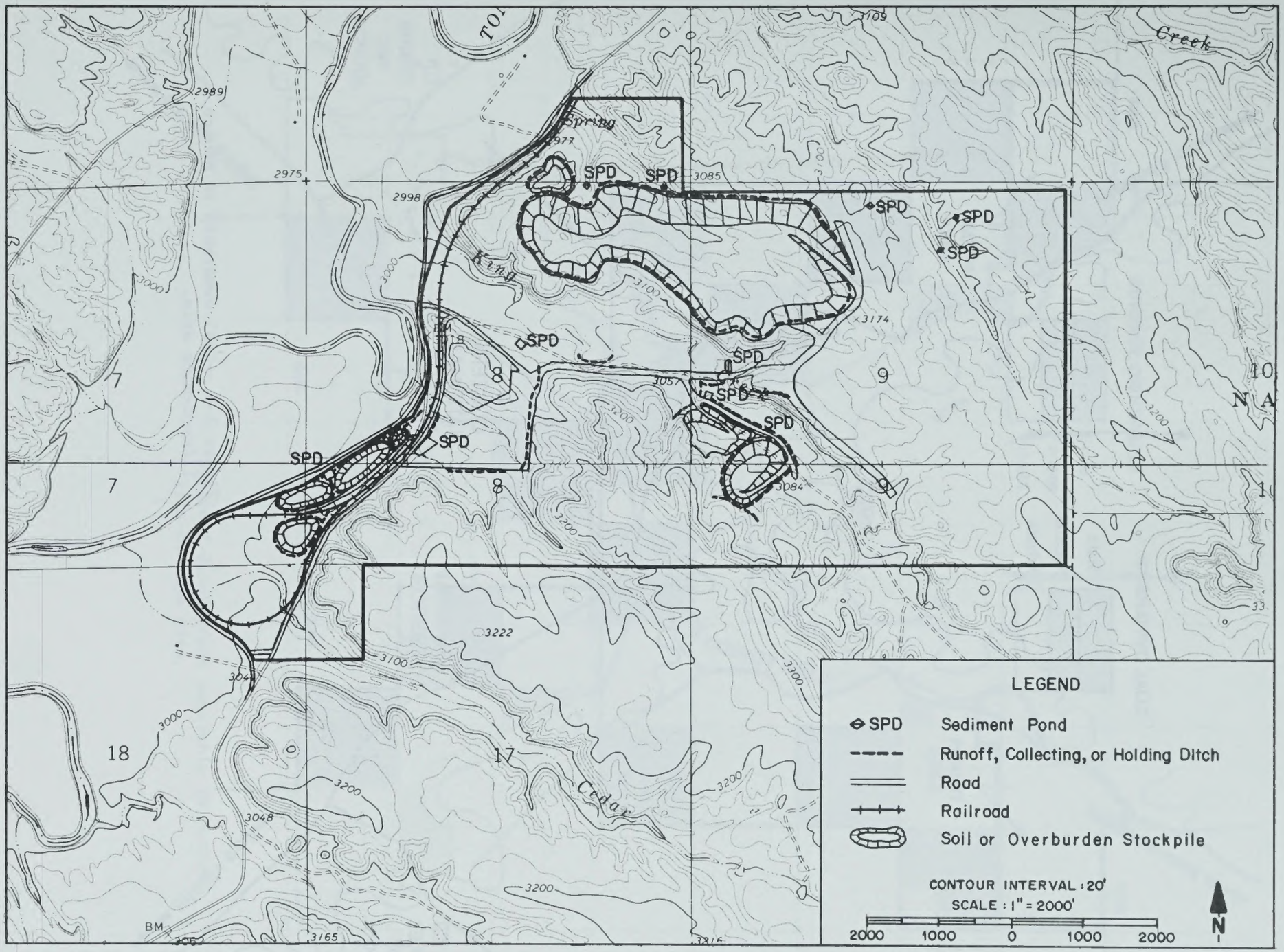

Figure I-5.--Location of drainage control ditches and sediment ponds.

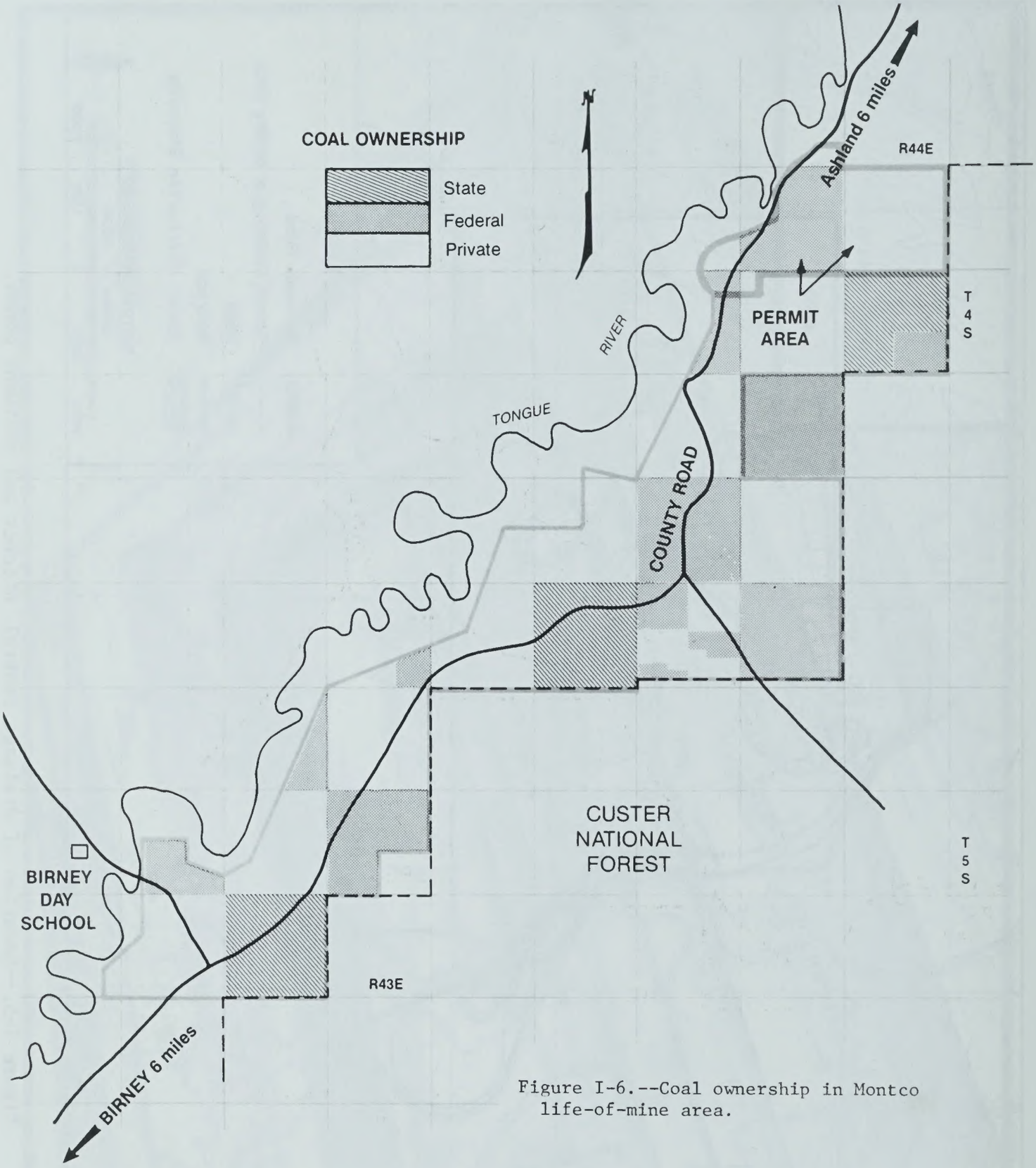

Figure I-6.--Coal ownership in Montco life-of-mine area.

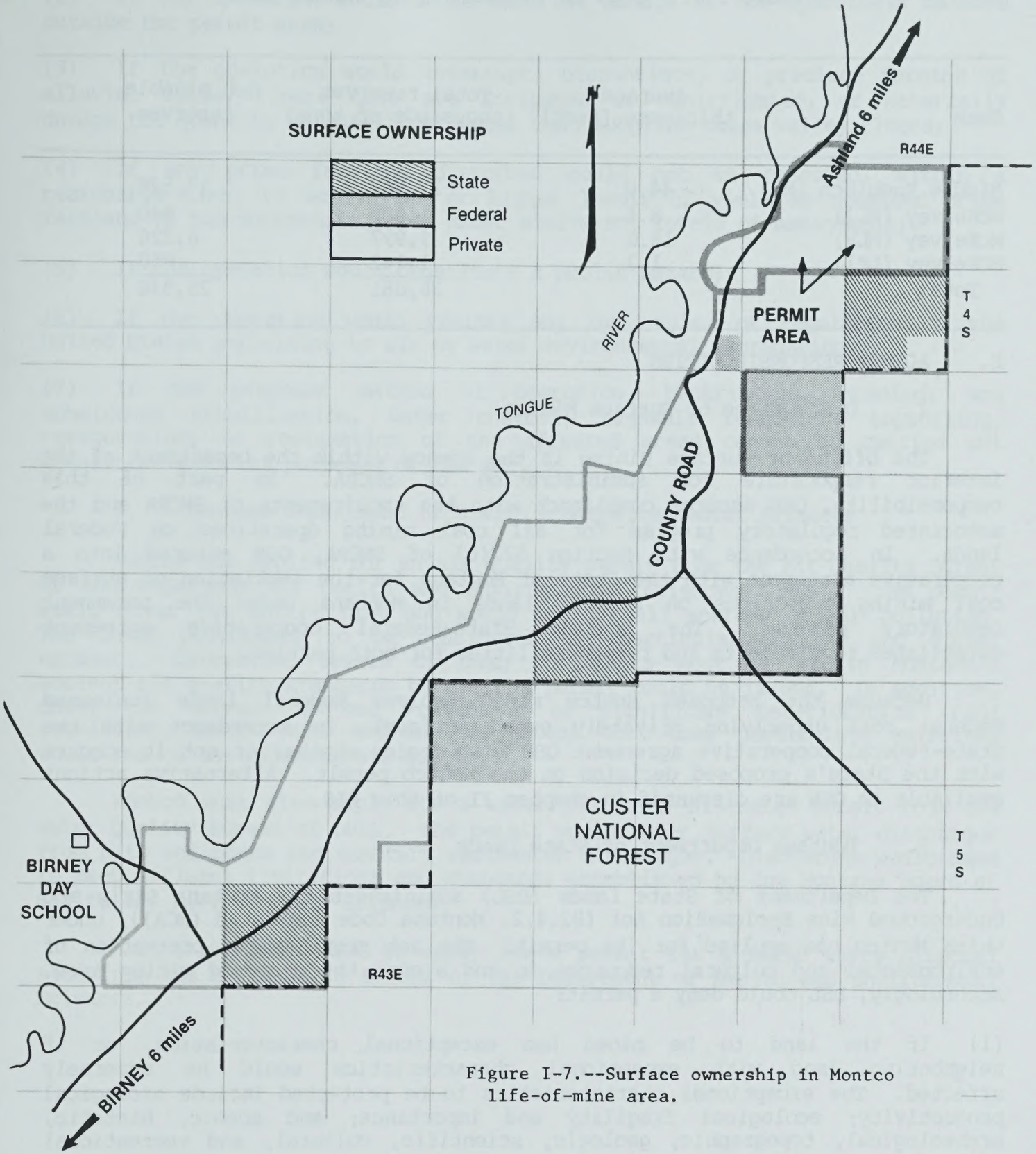

Figure I-7.--Surface ownership in Montco life-of-mine area.

Table I-3.-- Coal in the North King mining unit

Seam	Average thickness (feet)	Total reserves (thousands of tons)	Net minable reserves
Middle Knobloch (MK)	44.0	23,942	17,520
McKelvey (ML1)	8.6	1,000	840
McKelvey (MLV)	16.0	9,997	6,320
McKelvey (LF1)	1.7	1,142	850
Total		36,081	25,530

E. AGENCY RESPONSIBILITIES

1. U.S. Office of Surface Mining

The Office of Surface Mining is the agency within the Department of the Interior responsible for administration of SMCRA. As part of this responsibility, OSM assures compliance with the requirements of SMCRA and the associated regulatory program for all coal mining operations on Federal lands. In accordance with Section 523(c) of SMCRA, OSM entered into a cooperative agreement with the State of Montana for the regulation of surface coal mining operations on Federal lands in Montana under the permanent regulatory program. The Montana State-Federal cooperative agreement establishes requirements and responsibilities for both parties.

Because the proposed Montco mine involves Federal lands (unleased Federal coal underlying privately owned surface), in accordance with the State-Federal cooperative agreement OSM must decide whether or not it concurs with the State's proposed decision on the Montco permit. Alternative actions available to OSM are discussed in chapter II of this EIS.

2. Montana Department of State Lands

The Department of State Lands (DSL) administers the Montana Strip and Underground Mine Reclamation Act (82.4.2, Montana Code Annotated (MCA)), under which Montco has applied for its permit. The act provides for protection of environmental and cultural resources in and around the proposed mining area. Accordingly, DSL could deny a permit:

(1) If the land to be mined has exceptional characteristics, or if neighboring land with exceptional characteristics would be adversely affected. The exceptional characteristics to be protected include biological productivity; ecological fragility and importance; and scenic, historic, archeological, topographic, geologic, scientific, cultural, and recreational significance;

(2) If the operation would cause material damage to the hydrologic balance outside the permit area;

(3) If the operation would interrupt, discontinue, or preclude farming of alluvial valley floors that are irrigated or subirrigated, or materially damage the quantity or quality of water that supplies these valley floors;

(4) If any prime farmland disturbed could not be restored, within a reasonable time, to equivalent or higher levels of yield as nonmined prime farmland in the surrounding area under equivalent levels of management;

(5) If the operation would constitute a public hazard;

(6) If the operation would violate any law, rule, or regulation of the United States pertaining to air or water environmental degradation;

(7) If the proposed method of operation, backfilling, grading, and subsidence stabilization, water control, highwall reduction, topsoiling, revegetation, or reclamation of the affected areas cannot be carried out consistent with the purposes of the act.

3. Montana Department of Health and Environmental Sciences

Montco has applied for an air quality permit from the Air Quality Bureau of the Department of Health and Environmental Sciences (DHES). The permit would cover the entire mine and would include all sources of air pollution. The chief pollutants to be considered are particulate matter and diesel exhaust. Calculated levels of both pollutants must be within Montana's ambient air quality standards before the permit could be issued. In addition, under the current Montana Prevention of Significant Deterioration (PSD) regulation, Montco must address the amount that coal particulate emissions would reduce the existing air quality.

Montco must also apply for a water pollution discharge permit from the Water Quality Bureau of DHES. The permit would cover surface water discharges from pits and ponds and sanitary wastewater discharges. Discharges would have to meet effluent limitations and standards established by the Montana Board of Health and Environmental Sciences.

Montco may also have to apply for a permit for a solid waste disposal site from the Solid Waste Bureau of the Department of Health and Environmenal Sciences.

CHAPTER II

ALTERNATIVES

A. DESCRIPTION OF ALTERNATIVES

This EIS evaluates four alternatives that cover the range of decisions available to OSM regarding the Montana Department of State Lands (DSL) decision on the Montco permit application. The alternatives are as follows:

Alternative A--No action

Under this alternative, OSM would not participate in the Montana Department of State Lands (DSL) decision on the Montco permit application. This alternative is not reasonable because part of the proposed facilities for the Montco mine would lie on Federal lands, and therefore a decision by OSM is required by Article V.B.8. of the Montana State-Federal Cooperative Agreement for surface coal mining and reclamation operations on Federal lands (46 FR 20993). This article of the cooperative agreement requires written concurrence by OSM with the State final technical analysis, environmental analysis, and proposed decision on the permit application. Thus, no further consideration is given to the no-action alternative in this EIS.

Alternative B--Concurrence with the DSL decision

This is OSM's preferred alternative. Under this alternative, OSM could concur with any of the following alternatives proposed by DSL in its draft EIS on the Montco permit application:

1. No action.--If no action were taken by the DSL within 240 days after receipt of a completed application for a mining and reclamation permit, it is possible that the permit could be statutorily approved by default under Montana law.

2. Deny the permit.--DSL may reject a proposed plan that does not meet Montana's permanent regulatory program (ARM 26.4.301 et seq.).

3. Approve the permit.--DSL could approve Montco's permit application as submitted on October 6, 1981 and amended on October 17, 1983.

4. Selective denial of the permit.--DSL could deny the permit to mine in a specified area where reclamation consistent with the requirements of the Montana Act is not possible. The specified areas could include those having special, exceptional, critical, or unique characteristics, or where mining would affect the use, enjoyment, or fundamental character of neighboring land having the above special characteristics.

5. Approval of the permit with stipulations or mitigating measures.--DSL could approve the permit with any of the conditions (stipulations) or

mitigating measures considered necessary to meet the requirements of State law. Possible conditions identified by DSL are analyzed in Chapter IV of this EIS. Mitigating measures or conditions adopted by DSL would not be known until the permit were issued.

Alternative C--Concurrence with the DSL decision with additional conditions

Under this alternative, OSM would propose conditions in addition to any in the State approval. Such conditions are authorized under Article V.B.2. of the cooperative agreement with Montana, wherein "the Secretary reserves the right to act independently of the State to carry out his responsibilities under laws other than the Federal Act and in instances of disagreement under the Federal Act." To the extent DSL agreed with any such additional conditions, this alternative would amount to OSM concurrence under alternative B. To the extent DSL did not agree with any such additional conditions, OSM could withhold concurrence as described under alternative D. As provided in Article V.B.8. of the cooperative agreement, however, "In the event State Lands and [OSM] cannot agree to the final actions to be taken by State Lands and the Department..., the matter shall be referred to the Governor and Secretary for resolution."

Alternative D--Withhold concurrence

Under this alternative, OSM could withhold concurrence because either the State would not agree to conditions proposed by OSM, or because concurrence with issuance of the permit would violate SMCRA or any other Federal law. The likelihood of OSM and DSL ultimately not reaching agreement on the permit decision is remote given the provisions for resolution of disagreements recited in alternative C.

B. COMPARISON OF ALTERNATIVES

1. Alternative A--No Action

Because OSM is required to make a decision on the Montco mine, this alternative is not reasonable, and is not considered here.

2. Alternative B--Concurrence with the DSL Decision

Depending on the decision made by DSL, the environmental impacts of this alternative could range from essentially no impacts (deny the permit) to those discussed in chapter IV of this EIS (approval as proposed). Some impacts would probably occur regardless of any conditions DSL could reasonably attach to the permit. These impacts are unavoidable effects of surface mining in the northern Great Plains using current technology and reclamation practices. Unavoidable impacts that would last the life of the mine include the loss of the mine area for livestock and wildlife use; noticeably increased dust; adverse esthetic impacts; and increased use of the area's roads, recreation resources, and community facilities. Unavoidable impacts that would last well

beyond the life of the mine include an increased susceptibility of the reclaimed land surface to drought or mismanagement; a slight increase in total dissolved solids in the Tongue River, and changes in social organization from a rural, agricultural way of life to a more urban and industrial way of life. The loss of 13 cultural resource sites eligible for listing on the National Register of Historic Places would be permanent, although most of the information they contained would be recovered. Fiscal impacts in Powder River County would be difficult to avoid because the mine would pay taxes in Rosebud County.

a. Approval as Proposed

The environmental consequences of this alternative would be that the impacts described in this analysis would occur. Briefly, this alternative would cause moderately significant impacts on social conditions for the first few years of mine construction and operation, and moderately significant impacts on visual resources over the life of the mine. Impacts on other resources would not be significant in that the capability of those resources to support anticipated uses would be restored following mining.

b. Approval with Conditions

DSL might require Montco to adopt any of the mitigating measures listed in its EIS (MDSL, 1982d, chapter IV), or other measures to reduce environmental impacts. Adverse environmental impacts under this alternative would be less than if the permit were approved without conditions. The overall level of impact would probably not be greatly reduced because most of the impacts of the mine could not be avoided under any reasonable mining and reclamation plan. Some of the mitigating measures previously discussed in DSL's EIS have now been incorporated into Montco's revised permit application.

c. Selective Denial of the Permit

If OSM concurred with a DSL decision to selectively deny the permit to mine in certain areas, the level of impact would be reduced in comparison to either approval as proposed or with conditions. Depending on the area for which approval were denied, Montco might mine at a lower production rate, or perhaps complete mining operations sooner. However, it is not possible at this time to predict in what specific way the overall impact of the mine might be reduced.

d. Deny the Permit

If OSM concurred with a DSL decision to deny Montco's permit, the impacts described in chapter IV of this EIS would not occur. To the extent other lands were mined to meet energy demands, impacts would occur to those lands. Where and how other lands might be mined cannot be predicted. Mining areas with thicker coal seams (such as the eastern Powder River basin of Wyoming) could disturb less total acreage than at Montco. Mining areas with thinner coal seams, or areas of greater topographic relief, could result in more land disturbance.

3. Alternative C--Concurrence with the DSL Decision with Additional Conditions

During the review of the permit application package submitted by Montco, OSM has not identified any additional conditions it could require of Montco beyond those identified by DSL in its EIS (MDSL, 1982d, chapter IV). (Some of the DSL conditions, notably for soils and overburden handling, have been incorporated into Montco's latest permit application.) If any are identified during public review of this EIS, they could be required by OSM as a condition of concurrence with DSL's approval. These additional conditions might further reduce impacts, although any further reductions in overall impacts would probably be minor.

4. Alternative D--Withhold Concurrence

If OSM withheld concurrence with DSL's decision, the proposed Montco mine could not be approved. Impacts to the environment would not occur.

CHAPTER III

DESCRIPTION OF THE EXISTING ENVIRONMENT

A. GEOLOGY

1. Summary

Numerous geologic studies of the region have been undertaken, and additional geologic data have been supplied by Montco. The topography of Montco's entire life-of-mine area is one of a rolling, moderately-dissected bench, bounded on the east by uplands of Custer National Forest and on the west by the Tongue River. Ephemeral tributary streams to the Tongue River traverse the project area.

All coal resources of interest to Montco are within the Fort Union Formation, which underlies the entire life-of-mine area. No significant structural features are believed to be present. All coal is classified as subbituminous C.

Overburden chemical and physical properties vary widely throughout the life-of-mine area.

2. Previous Studies

The proposed Montco Mine is located in the Powder River Coal Basin of southeastern Montana and northeastern Wyoming. The geology of this region has been discussed in a previous environmental impact statement, DES 79-41 (U.S. Department of the Interior and Montana Department of State Lands, 1979). Earlier geologic work in the area has been reported by Warren (1959), Gilmour and Williams (1969), and Matson and Blumer (1973). Additional geologic information on the area has been submitted by Montco in its permit application.

3. Topography and Geomorphology

a. North King Mining Unit

Montco's proposed 5-year mine plan area lies in the North King mining unit. The North King unit lies north of King Creek, which is an incised, ephemeral tributary to the Tongue River (fig. III-1). Associated topsoil stockpiles and mining facilities are located south of King Creek and along the Tongue River. The North King unit lies on a bench above both the Tongue River and its associated terraces to the northwest, and below uplands of Custer National Forest to the east. The bench is moderately dissected and drained by ephemeral tributaries of King Creek and the Tongue River. Topographic relief of the North King unit is about 200 feet.

Visual observations indicate that erosion is probably moderate to moderately severe over the North King unit. Vegetation cover is sparse, and

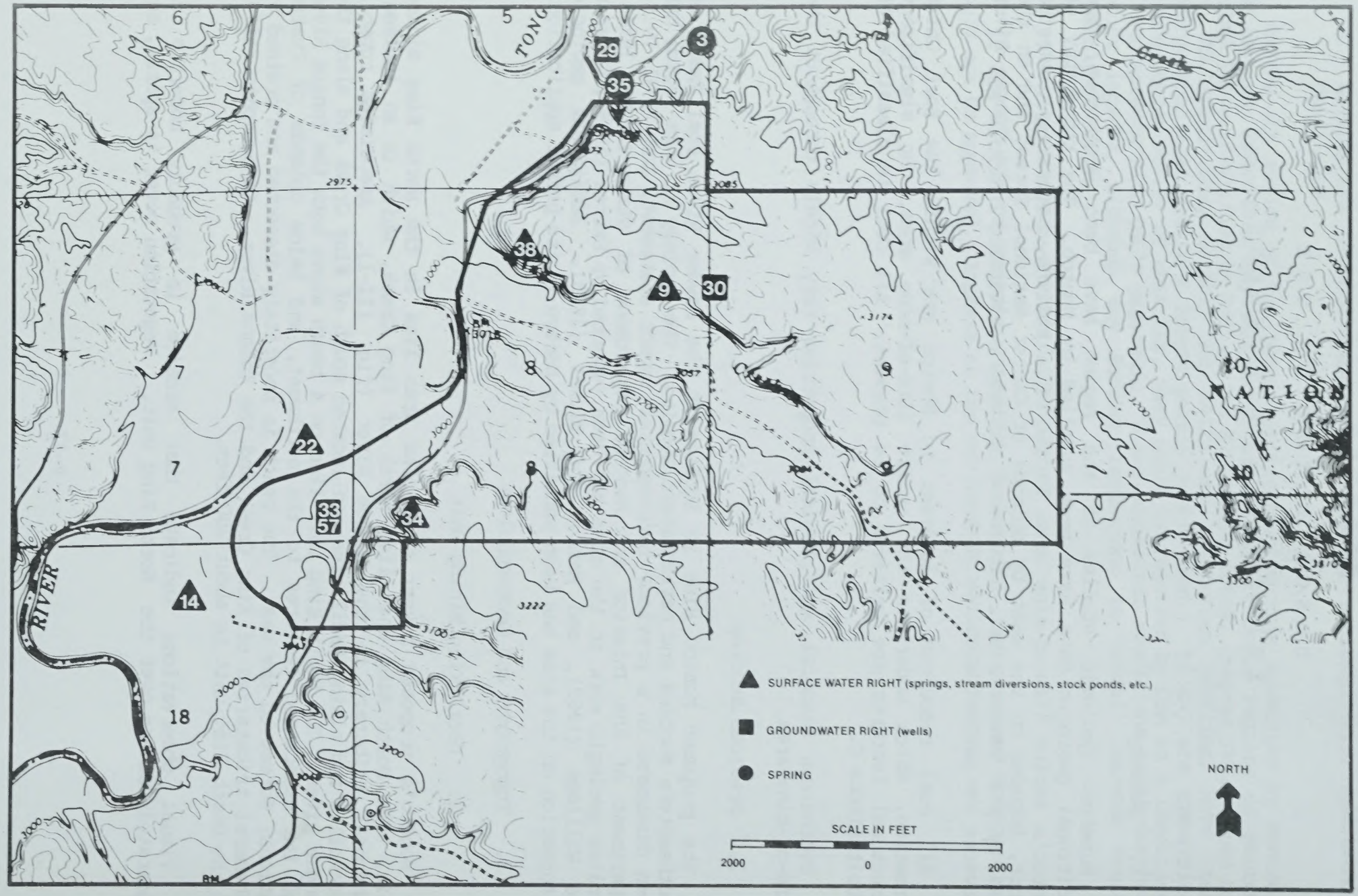

Figure III-1.--Water rights in the permit area.

pedestalling of grasses was observed in the field. Surface runoff from normal rainfall and snowmelt erodes bare soil and intermittently transports it toward ephemeral channels draining the area. Bedrock outcrops are common and limit soil erosion due to surface runoff. Dominant erosion processes on hillslopes and interfluves result from wind, rainsplash, and sheet and rill wash. Gully formation and head-cutting in the ephemeral channelways are locally active; however, outcrops of bedrock appear to limit these erosional processes.

b. Life-of-Mine Area

The life-of-mine area stretches approximately 12 miles southwestward from the North King unit along the east bank of the Tongue River to just south of Birney Day Village on the Northern Cheyenne Indian Reservation (fig. III-2). The project area is over 4 miles wide at its widest point, and averages about 2 to 3 miles in width.

Numerous ephemeral streams tributary to the Tongue River traverse the area from the southeast to northwest. Topography of the mine plan area is similar to that of the North King unit. The major zones of economic coal deposits underlie a bench between the Tongue River and associated terraces and uplands of Custer National Forest. Maximum topographic relief within the mine plan area is approximately 600 feet.

4. Stratigraphy and Structure

The entire mine plan area is underlain by the Tongue River Member of the Fort Union Formation, which contains all coal seams of economic importance in this area. The Tongue River Member is composed mainly of variegated mudstone, shale or claystone, and interbedded sandstone layers. Underlying the Tongue River Member are the Lebo Shale and Tullock Members of the Fort Union Formation. Beneath the Fort Union Formation lies the late Cretaceous Hell Creek Formation, which is a reliable aquifer in the region and probably supplies several of the most productive deep water wells within the Tongue River Valley.

Five major coal seams lie within the project area, all within several hundred feet of the surface. They are, in descending order,

Upper Knobloch
Middle Knobloch
Lower Knobloch
McKelvey
Nance

Numerous thin stringers of coal are also present, but they are typically unnamed, discontinuous, and economically insignificant. Only the Middle Knobloch seam is continuous throughout the life-of-mine area (fig. III-3).

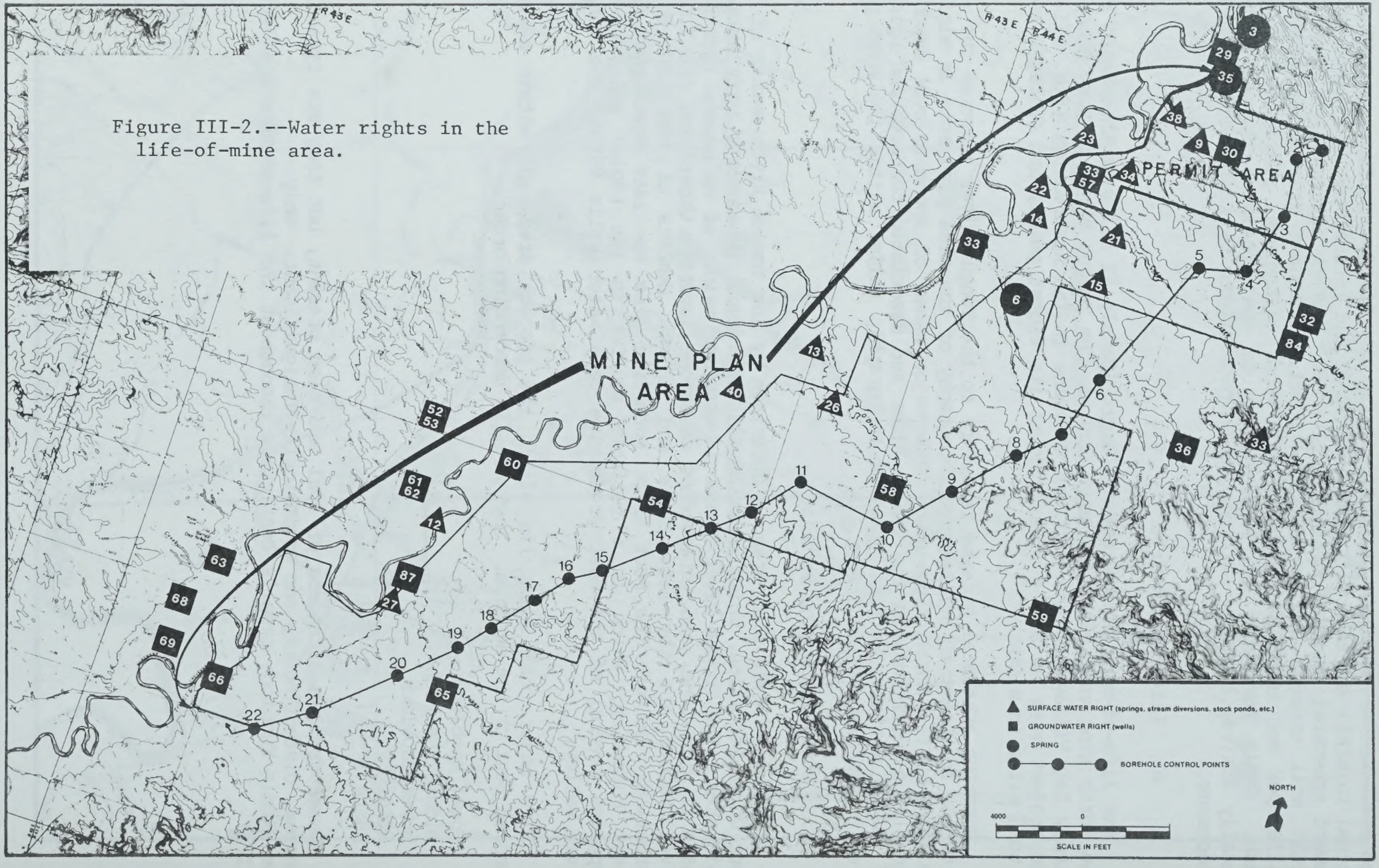

Figure III-2.--Water rights in the life-of-mine area.

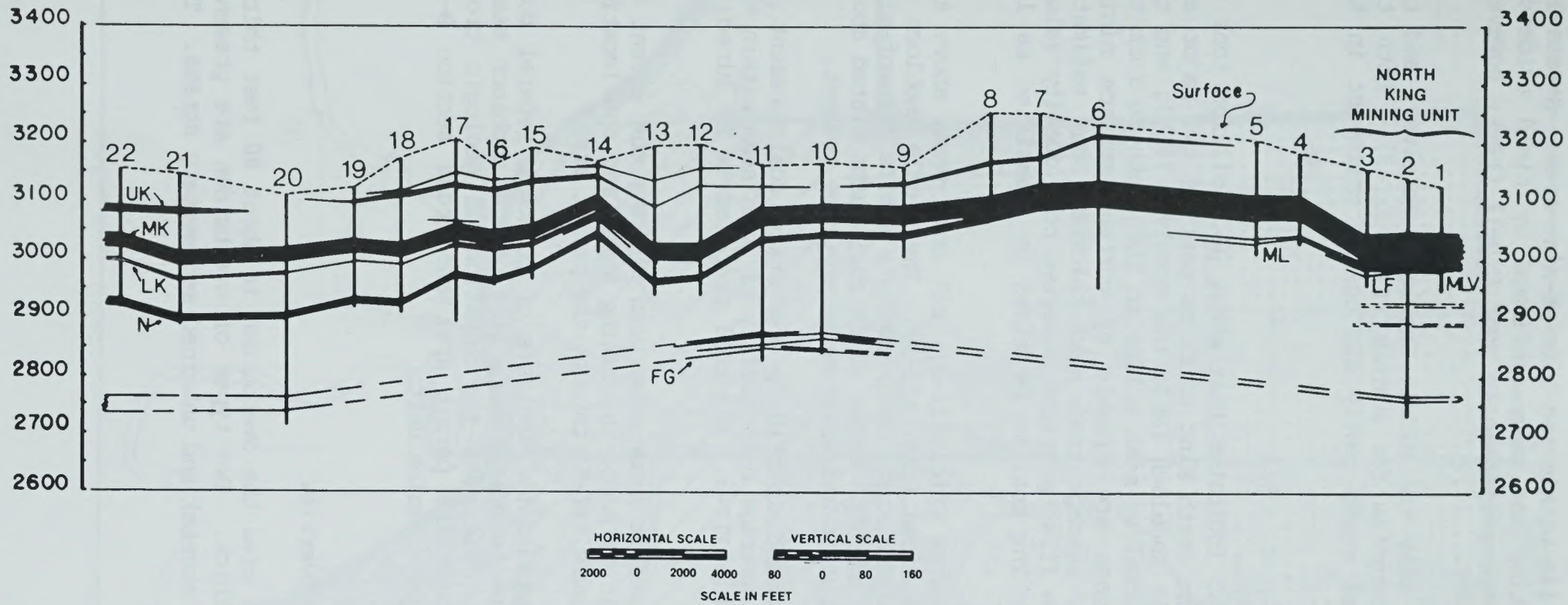

Figure III-3.--Geologic cross section of the life-of-mine area. Location of the cross section is shown on figure III-2.

UK--Upper Knobloch
MK--Middle Knobloch
LK--Lower Knobloch
N---Nance

FG---Flowers-Goodale Bed
ML---Local beds that coalesce to form McKelvey
MLV--McKelvey
LF---Local beds above Flowers-Goodale

No major structural features lie within the life-of-mine area. Strata lie nearly flat, and no major faulting has been confirmed by field evidence. Linear features have been observed, particularly near O'Dell Creek; however, their significance is probably minor.

Within the North King unit, only the Middle Knobloch, McKelvey, and the Local Flowers (LF1) seams are targeted for mining (fig. III-3). Both the Middle Knobloch and McKelvey coal seams gently dip to the northwest in the unit.

5. Coal Resources

Information supplied by Montco indicates that about 36.1 million tons of minable coal reserves underlie the North King unit, as part of two major and one minor coal seams: the Middle Knobloch (MK), the McKelvey (MLV), and the LF1. (See figure III-3.). The McKelvey seam splits to the south to form the MLV and ML1. All of these seams are minable by current surface mining techniques. Table I-3 indicates average coal seam thickness and estimated resources within the unit. Table III-1 provides selected coal quality values for the four seams to be mined. The coal to be mined is classified as low sulfur, subbituminous C.

Within Montco's life-of-mine area (fig. III-2), all coal seams above and including the Nance seam would be mined (fig. III-3). The Middle Knobloch is the only coal seam known to be continuous within Montco's entire life-of-mine area and is the primary target of mining. Other major coal seams listed above are present in one or more mining units and would be mined where present.

Table III-2 indicates the amount of private and State coal present in Montco's life-of-mine area. The average coal quality of each seam within the life-of-mine area is shown in table III-3. All coal proposed to be mined is classified as subbituminous C.

Figure III-4 indicates the permit area mine plan showing the extent of Federal unleased coal, the facilities area, the mining area, and the location of geologic cross section A-A (figure III-5) through the permit area.

Figure III-6 indicates the applicant's analysis of economic Federal coal resources showing the life-of-mine boundary, burn line of the Knobloch seam, economic and uneconomic Federal coal, and the location of geologic cross section A-A (figure III-5) through the permit area and cross section B-B' (figure III-7) through the South Gate mining unit.

6. Overburden

a. Montco Project Area Overview

Throughout the Montco project area the overburden is about 80 feet thick, the interburden about 15 feet thick. Two types of overburden are present: burned material (commonly called scoria) and unburned sedimentary strata. The

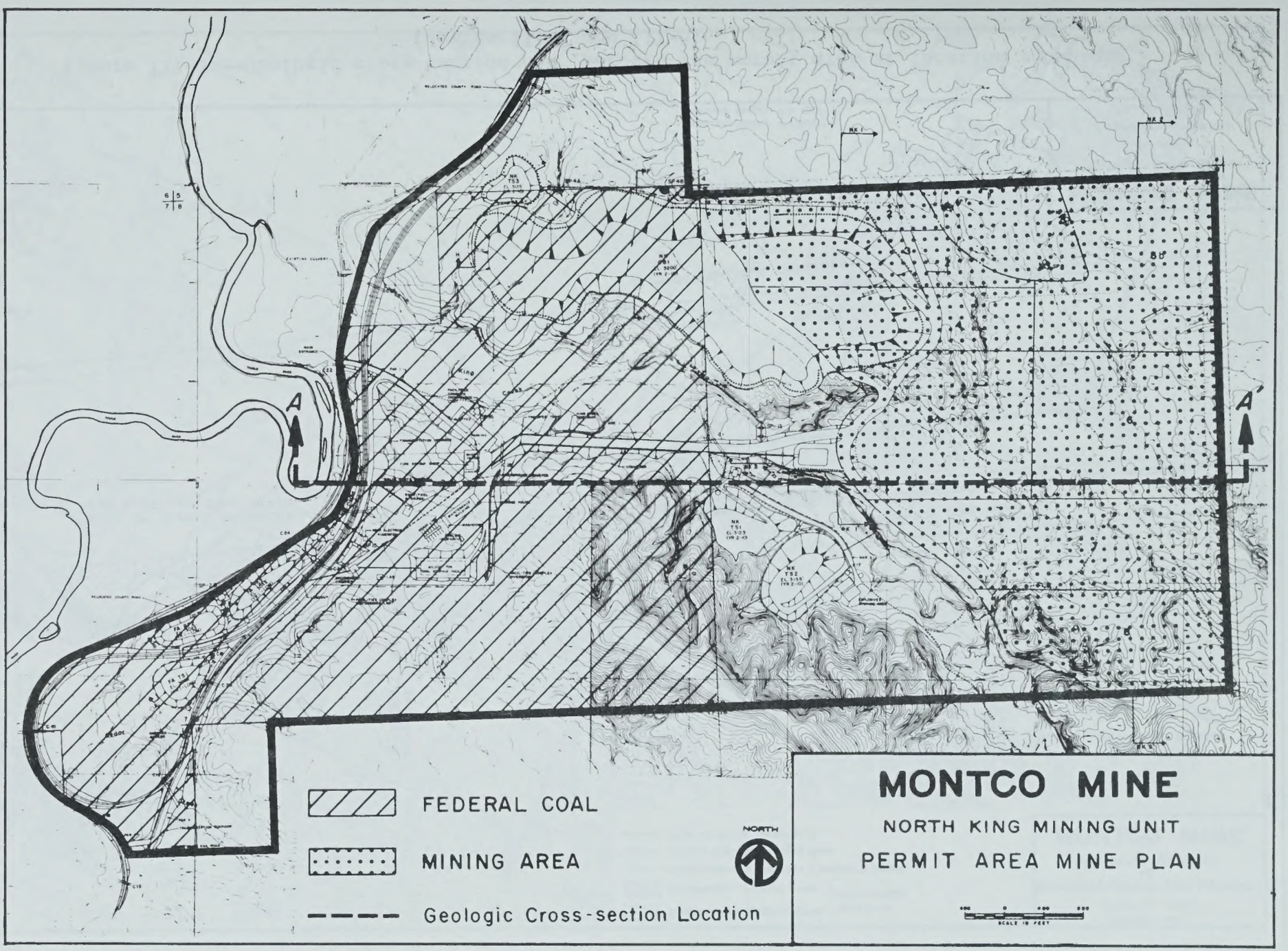

Figure III-4.--Permit area mine plan showing the extent of Federal unleased coal, the facilities area, the mining area, and the location of geologic cross section A-A' (fig. III-5) through the permit area.

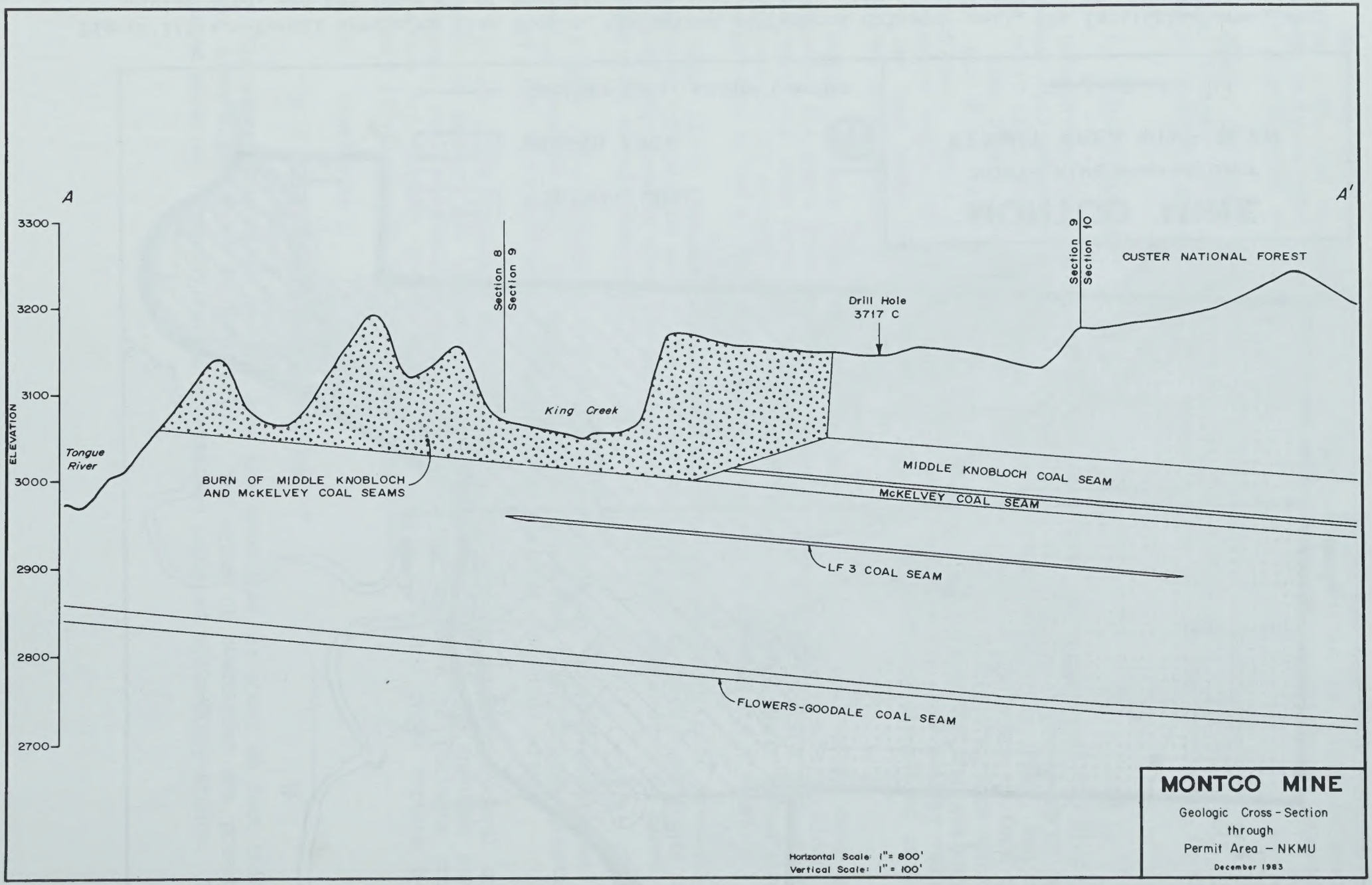

Figure III-5.--Geologic cross section A-A' through the permit area at location shown on figures III-4 and III-6.

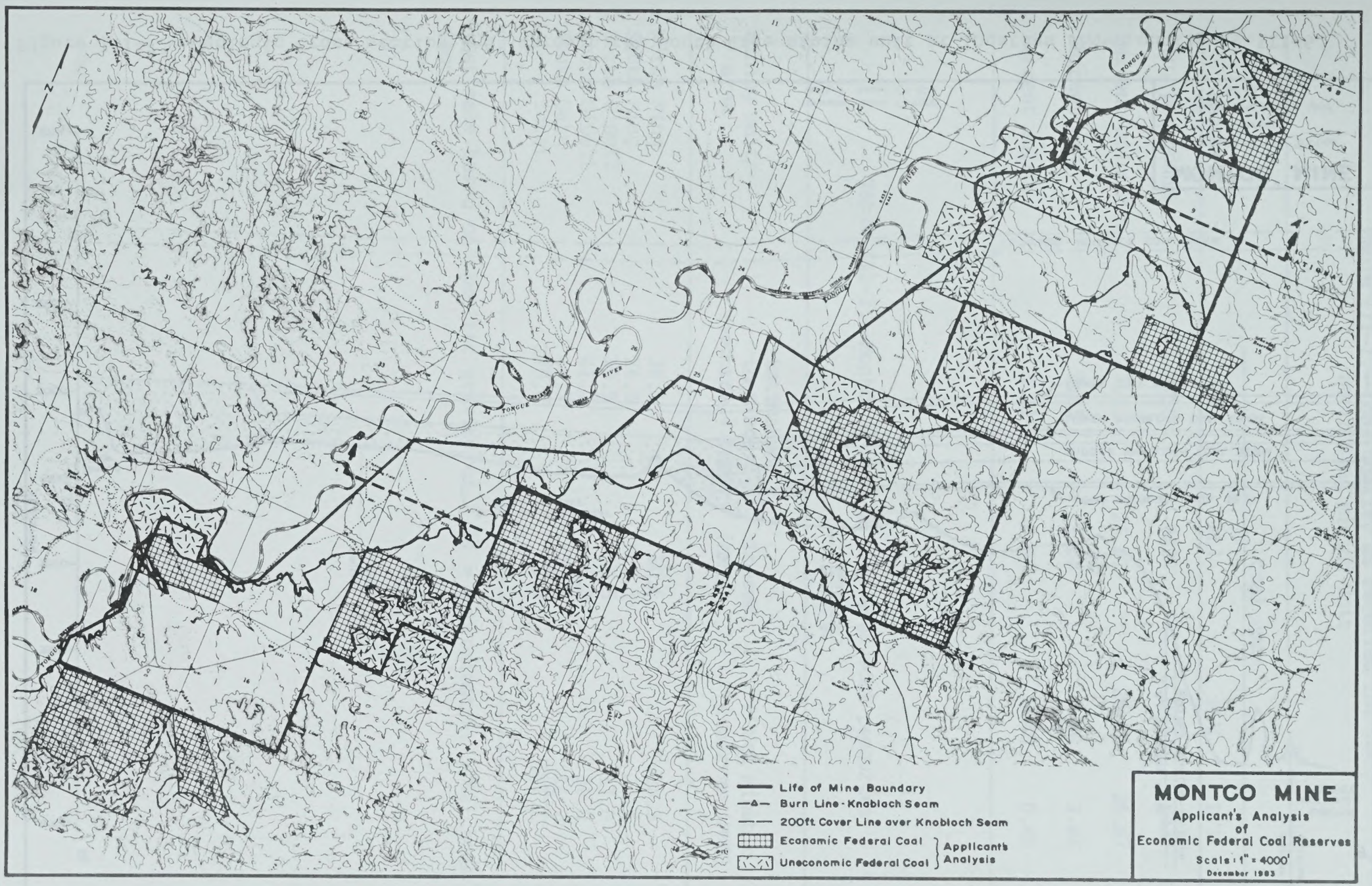

Figure III-6.--Applicant's analysis of economic Federal coal reserves showing the life-of-mine boundary, burn line of the Knobloch seam, economic and uneconomic Federal coal, and the location of geologic cross section A-A' (fig. III-5) through the permit area and cross section B-B' (fig. III-7) through the South Gate mining unit.

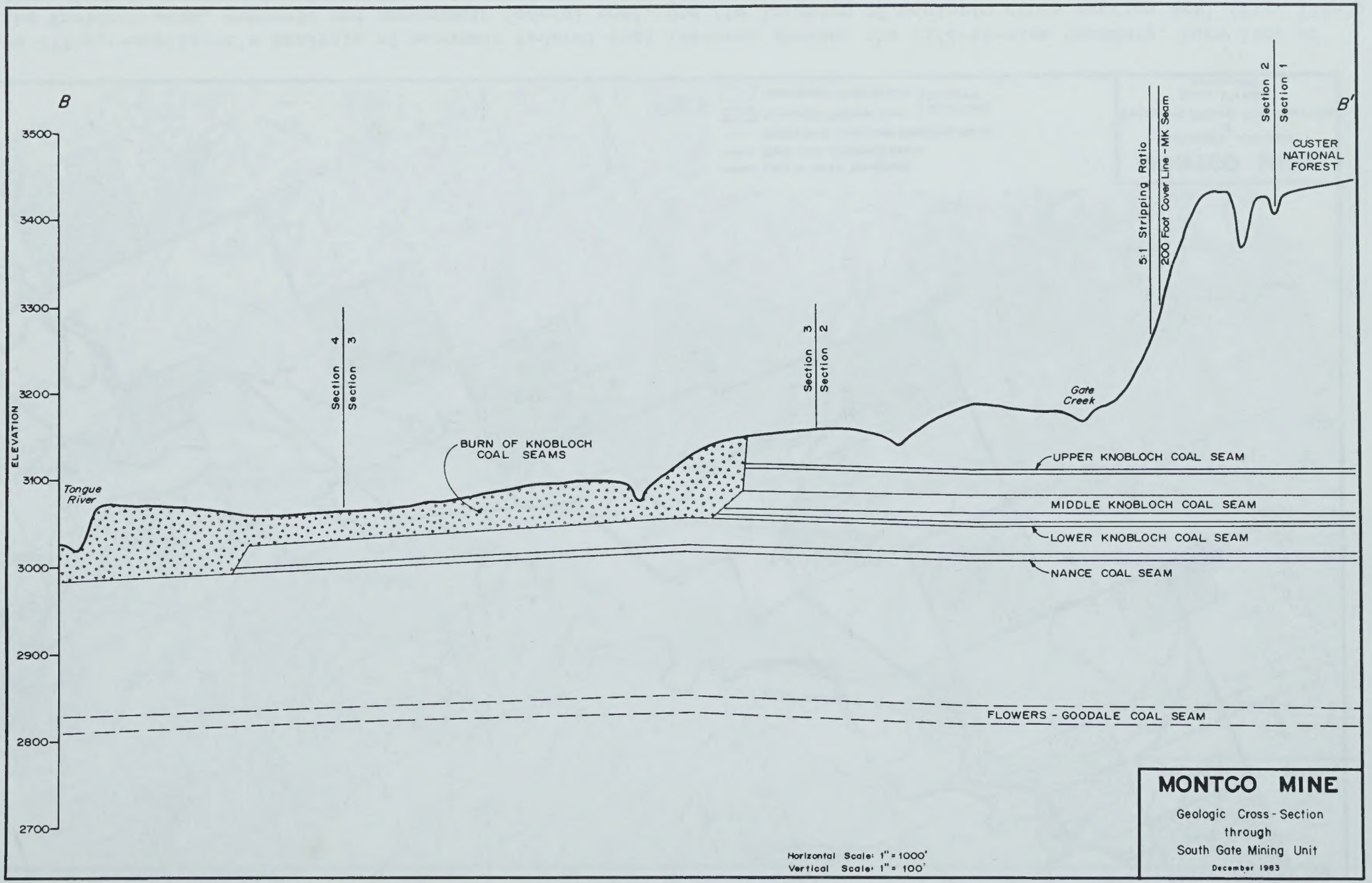

Figure III-7.--Geologic cross section B-B' through the South Gate mining unit at location shown on figure III-6.

Table III-1.--Coal quality as received for the North King mining unit

Measure	Coal seam			
	MK	ML1	MLV	LF1
Btu, per pound	8755	8437	8437	8437
Percent moisture	27.13	26.87	26.87	26.87
Percent ash	5.65	9.88	9.88	9.88
Percent sulfur	0.31	0.40	0.40	0.40

Table III-2.--Montco's life of mine area coal resources

Mining unit/ area	Estimated in-place resource [1] (MMT)	Losses (MMT)	Net minable reserves (MMT)
North King	36.1	10.6	25.5
South King	24.5	3.1	21.4
North O'Dell	19.5	2.5	17.0
South O'Dell	41.2	5.2	36.0
South Gate	48.7	12.5	86.2
Total	220.0	33.9	186.1

[1]Estimate based on specific gravity of 1.34 = approximately 1,821 tons/ acre foot.

unburned strata consist mainly of intermixed beds of soft sands, silt, and clay materials, in association with shale and sandstone. The scoria (clinker) consists of these sediments after they were baked or "burned" by the heat of burning coal below the sediments. The scoria is generally more coarsely textured than the unburned sediments.

Table III-3.--Average as received coal quality

Seam	Percent moisture	Btu per pound	Ash	Sulfur
Upper Knobloch	25.06	8786	7.12	1.02
Middle Knobloch	24.12	9195	5.33	0.32
McKelvey	26.87	8560	9.05	0.40
Lower Knobloch	23.57	9318	5.66	0.50
Nance	24.39	9034	6.37	0.42

In this text "overburden" includes interburden. Overburden is the material between the upper coal seam and the soil; interburden is the material between coal seams. Overburden clay mineralogy-clay mineral composition was determined from samples taken in the North King and South O'Dell mining units. Illite and kaolinite clay minerals dominated all sample increments analyzed. Chlorite was present in small amounts, and no smectite was detected. On the average, the overburden has an alkaline pH, is moderately saline, and is often sodic. The overburden, however, contains beds that are suitable for use in the 8-foot root zone layer required by DSL. Table III-4 lists thicknesses of favorable overburden material penetrated in test holes drilled in the various mining units.

"Unfavorable root zone material" means overburden with chemical and physical levels that do not meet the criteria of table III-5. "Favorable root zone material" is overburden that meets the criteria of the table.

b. Proposed Permit Area--North King Mining Unit

For the North King mining unit overburden physicochemical characteristics were determined from a total of 469 sample increments from 22 drill cores. The drill core samples can be divided into two very different sets--those consisting largely of burn material (porcelanite, commonly called scoria), and those from the remainder of the unit, associated with the existing coal bed.

Table III-4.--Favorable overburden available in the Montco life-of-mine area

Core	Depth(s) (feet)	Total thickness (feet)
North King Mining Unit		
4449-1	5-40	35
4449-2C	20-40	20
4449-3C	0	0
4449-4C	20-40	20
4449-5C	0-10, 25-35	20
4449-6C	0	0
4449-7C	0-90	90
4449-70BC	12-95	83
4449-8A	35-55, 65-100, 110-140	85
4449-11A	0-145	145
4449-12D	10-90	80
4449-13A	0	0
4449-14A	55-65	10
4449-16B	0-30	30
4449-16D	0-25	25
4449-17B	25-125	100
4449-19W	0-40, 45-65, 85-130	105
4449-20	0-150	150
4449-21	0	0
4449-22	0	0
4449-23C	30-40	10
4449-26C	175-185	10
Average thickness		46.3
South King Mining Unit		
44416-1	20-45, 60-70	35
44416-1C	19-49	30
44416-4	0	0
44416-14	15-25, 30-45, 55-125	95
44416-15	0-20, 35-50 160-240	115
Average thickness		55.0
North O'Dell Mining Unit		
44429-C	0	0
44431-3C	0	0
Average thickness		0
South O'Dell Mining Unit		
44431-OW1	10-75	65
44431-5C	10-40	30
44431-7C	5-45	40
44431-10	0-20	20
44431-12	220-255	35
44431-13C	25-35, 40-60	30
44336-3C	0	0
44336-4C	15-45	30
44336-40BC	20-60	40
44336-5RC	55-65	10
44336-8	0-85	85
44336-10C	0-40	40
44336-11C	0	0
44336-16C	0	0
44336-18	0-15, 20-35, 280-290	40
44336-20	0-15, 20-40	35
44335-3C	15-85	70
44335-5C	0-15, 85-105	35
44335-8RC	20-30, 35-75, 80-90	60
Average thickness		35.0
South Gate Mining Unit		
3643-E	22-30	8
3645-E	0	0
3646-E	0	0
3647-E	0-20	20
3648-E	0	0
3649-E	20-45.6	25.6
3650-E	0-10, 86.2-106.2	30
3651-E	0	0
3653-E	20-32.8	12.8
3654-E	40-50	10
3655-E	6.4-27.5	21.1
3656-E	10-24, 26-42.2	30.2
3657-E	0	0
3658-E	0	0
3659-E	0	0
3660-E	0	0
3662-E	0	0
3663-E	0-34	34
3664-E	0	0
54310-1C	0	0
54317-4RC	0-15	15
54320-2C	0	0
Average thickness		9.4

Source: This table was extrapolated by DSL from data in Appendix N of the Montco Permit Application (1983). (Note: Suitability is based on the criteria given in table III-5. Only the cores with geochemistry data available were used for this table. Favorable core increments of less than 10 feet were not considered because thin, isolated overburden strata would be difficult and impractical to handle separately in the field.)

Table III-5.--Unsuitability criteria for overburden and regraded spoils
[Source: This table is based on a recent, extensive literature review by the Montana Department of State Lands' technical staff]

Parameter	Suspect level [1]	
pH	<5.5 >8.5	
Conductivity (mmhos/cm)	>4.0-8.0[2]	
Saturation percentage	<25 >85	
Exchangeable sodium percentage	>15.0	Clay loam (≦35% clay) silty clay loam (≦35% clay, ≧15% sand), sandy clay loam, silt loam (≧20% clay, ≧15% sand), loam (≧20% clay).
	>18.0	Sandy loam, loam (<20% clay), silt loam (<20% clay, ≧15% sand).
Sodium adsorption ratio	>11.0	Clay loam (≦35% clay), silty clay loam (≦35% clay, ≧15% sand), sandy clay loam, silt loam (≧20% clay, ≧15% sand), loam (≧20% clay).
	>14.0	Sandy loam, loam (<20% clay), silt loam (<20% clay, ≧15% sand).
Boron (ppm)	>5	
Molybdenum (ppm)[3]	>0.5-1.0	
Selenium (ppm)	>0.1	
Textural class	Clay, sandy clay, silty clay, clay loam (>35% clay), silty clay loam (>35% clay, <15% sand), silt loam (<15% sand), silt, loamy sand, sand.	

[1] The suspect levels are to be used as a guide in evaluating the suitability of material for reclamation. An evaluation should take into account the "total system." Interactive parameters may either nullify or verify the significance of a potential problem.

[2] The actual maximum acceptable salt level will depend on the plant species proposed in the revegetation plan and the potential for upward salt movement.

[3] The actual maximum acceptable molybdenum level will depend upon the plant species proposed in the revegetation plan and their potential for molybdenum accumulation.

The porcelanite materials exhibit low sodicity, and salinity; have an alkaline pH; and range in texture from sandy loam to silt loam when crushed and passed through a 0.85-mm sieve. The concentrations of those trace elements tested are low. In their natural state these materials commonly are coarse textured. The second set of samples from unburned strata are more saline and/or sodic. Their textural class is loam, although many samples fall into the clay loam textural class; and their pH is alkaline.

The samples from the various increments can be classified as favorable or unfavorable. Table III-4 lists the footage of favorable overburden encountered in the drill cores from the North King mining unit. The data show that favorable overburden present would easily provide for the required 8-foot cover of favorable overburden over the unfavorable spoils.

Although some trace elements in some overburden samples exceed the Montana Department of State Lands (DSL) rescinded guidelines, a recent literature review by the DSL indicates that none of the trace elements in the favorable overburden would be detrimental to revegetation or animals grazing or browsing on vegetation rooted in favorable overburden.

c. South King Mining Unit

Information on the physicochemical characteristics of the South King mining unit overburden is limited to five drill cores analyzed to date. Based on the samples taken, overburden material favorable for use in the root zone averages 55 feet in thickness (table III-4).

d. North O'Dell Mining Unit

Physicochemical information on the North O'Dell mining unit is limited, since only two drill cores were taken in this area. No favorable overburden was encountered in these holes. Additional test cores are needed to determine the absence or presence of favorable overburden at this unit. If no favorable material is present, this unit probably would not be mined unless sufficient favorable overburden could be obtained from other units or from adjacent areas of Federal coal that could be added to the unit.

e. South O'Dell Mining Unit

Physicochemical characteristics of the South O'Dell mining unit are based on the analyses of 18 drill cores. Average thickness of favorable overburden in this unit was 35 feet.

f. South Gate Mining Unit

Physicochemical characteristics of the South Gate mining unit are based on the analyses of 22 drill cores.

Favorable overburden averages 9.4 feet in thickness in the 22 drill holes. This indicates that sufficient favorable overburden to provide the 8 feet of favorable overburden required by the DSL may not be present in this area.

B. HYDROLOGY

1. Summary

All surface drainage from the facilities area and North King mining unit flow to the Tongue River. The facilities and mining unit lie astride King Creek, an ephemeral tributary to the Tongue River. Montco proposes to mine 566 acres north of King Creek from beneath a bench. The Tongue River, unlike most water sources of lesser quality in southeastern Montana, is of high quality and is considered unique to the region.

Significant ground-water resources in the mine area are limited primarily to alluvium of the Tongue River, the Tullock member (locally called the Lance aquifer) of the Fort Union Formation, and the Hell Creek Formation. The coal seams and alluvium along King Creek will also yield small quantities of water to wells. Ground-water flow in the coal seams and the alluvium is from southeast to northwest, toward the Tongue River.

In the vicinity of the North King unit, King Creek alluvium drains northward to the Middle Knobloch and McKelvey coal seams and associated clinker areas. Accordingly, King Creek alluvium is dry or nearly dry. Ground-water quality around the North King unit is best in the Tongue River alluvium and worst in the coal seams.

2. Surface Water

Surface-water resources of the Montco life-of-mine area and adjacent reaches of the Tongue River Valley have been described briefly in a previous regional environmental impact statement, DES 79-41 (U.S. Department of Interior and Montana Department of State Lands, 1979), and elsewhere in more detail (Woessner and others, 1981; Knapton and Ferrerira, 1980; Knapton and McKinley, 1977). In addition, the Montana Department of State Lands (DSL) and U.S. Office of Surface Mining (1982) recently reviewed the hydrology of the Tongue River Valley in response to a petition to declare a portion of the valley and region unsuitable for suface coal mining.

Montco's North King mining unit is drained entirely by ephemeral tributaries to King Creek and the Tongue River (fig. III-2). Facilities and a railroad loop to serve the Montco Mine are proposed for near the mouth of Cedar Creek, approximately one-half to one mile southwest of the North King unit.

King Creek and Cedar Creek are ephemeral drainages in and adjacent to the North King unit. Table III-6 indicates the size of these drainages and other major ephemeral drainages in Montco's life-of-mine area. Ephemeral drainages flow only in response to infrequent intense or prolonged rainfall events, or during rapid snowmelt in the spring. All surface drainage within the North King unit and the mine plan area is northwestward to the Tongue River, a major perennial stream in the region.

Table III 6.--Major ephemeral drainages and watershed areas in the Montco life-of-mine area

Drainage	Watershed area (square miles)
Poker Jim Creek	20.1
Poker Teechee Creek	5.7
Gate Creek	3.3
O'Dell Creek	46.3
Dry Creek	4.6
Cedar Creek	1.8
King Creek	12.6

The Tongue River's headwaters lie in the Big Horn Mountains of north-central Wyoming. The river flows northeastward to join the Yellowstone River near Miles City, Montana. Total watershed area of the Tongue River is approximately 5,400 square miles; about 2,900 square miles lie upstream of Montco's life-of-mine area. Tongue River discharge extremes in the vicinity of the Montco life-of-mine area typically range from a minimum of about 200 cubic feet per second (cfs) to a maximum of about 2,000 cfs. Maximum discharge of record near the Montco life-of-mine area was 8,340 cfs during a major flood in May 1978. Mean annual discharge of the river at the Tongue River dam upstream from the Montco life-of-mine plan area and at a gaging station below the area is about 400 cfs.

Montco proposes to obtain a permit for 881 acres of mining and associated disturbance in the North King unit and another 393 acres for mine facilities. These areas represent approximately 0.05 and 0.02 percent of the Tongue River watershed above the life-of-mine area. Montco's current plan ultimately calls for mining disturbance and facilities for approximately 10,171 acres, or 0.5 percent of the Tongue River drainage above the mine plan area.

Only one spring, the McKelvey Spring, is located in or near the North King unit (spring 35 in figures III-1 and III-2). The spring discharges at a rate of approximately 2-5 gallons per minute (gpm) from the base of the Middle Knobloch-McKelvey burn (clinker or scoria) adjacent to the Tongue River and its terraces. The aquifer which supports this spring is not definitely known; however, the spring's recharge area may be the coal seams to the east, the clinker area itself, or a combination of both of these sources.

Other springs in or adjacent to the life-of-mine area are also shown on figure III-2. Table III-7 provides more information on springs in the life-of-mine area.

Table III-7.--Springs in and adjacent to Montco's life-of-mine-area
[From Montana Office of the State Engineer records, notices of completion of ground-water appropriations without wells]

1 I.D. No.	Owner	2 Location T	R	S	QQQ	Date filed	3 Elevation (ft)	Flow (gpm)	4 Use	Name/ comments
1	H. Brey	3S	44E	27	center	-	3060	20.0	-	-
2	USFS	4S	44E	3	CDD	1951	3160	0.4	-	Bridge Creek
3	R.G. Schaudel	4S	44E	5	ADB	1920[5]	3000	3.0	-	-
4	USFS	4S	44E	13	DCC*	1938	3600	0.5	-	King Creek Pass
5	USFS	4S	44E	13	DCC	1938	3700	0.3	-	King Creek Pass
6	H.T. Wagner	4S	44E	19	ABC	1905	3040	1.0	S	-
7	USFS	4S	44E	26	CAA	1938	3600	0.1	-	King Creek No. 2
8	USFS	4S	44E	26	CBB	1938	3540	0.1	-	King Creek
9	USFS	5S	43E	12	DDC	1937	3560	0.75	S	-
10	USFS	5S	43E	27	BDC*	1937	3420	1.5	S	-
11	USFS	5S	44E	1	BBB	1938	3717	0.5	-	Good Creek
12	USFS	5S	44E	1	DCC	1938	3960	0.1	-	King Creek #1
13	USFS	5S	44E	1	AAA	1938	4100	0.5	-	Black Canyon
14	USFS	5S	44E	1	CDD	1938	3960	0.5	-	Twin
15	USFS	5S	44E	3	BCC	1938	3650	0.5	-	Hole in Wall
16	USFS	5S	44E	3	BCB	1938	3900	0.5	-	Hole in the Wall
17	USFS	5S	44E	10	AD*	1962	3450	0.75	-	East Fork O'Dell
18	USFS	5S	44E	11	AAB/C	1963	3850	0.7	S	E. Fork O'Dell#2
19	USFS	5S	44E	18	ADC	1937	3580	0.25	S	-
20	USFS	5S	44E	19	BDA	1937	4050	1.5	S	-
21	USFS	5S	44E	24	BAA	1938	3900	0.5	-	Brian Creek #1
22	USFS	5S	44E	25	DCC	1948	3850	0.4	-	Perry #2
23	USFS	5S	44E	25	BBB	1938	4080	0.1	-	Coal Bank
24	USFS	5S	44E	25	BDD	1938	3800	0.1	-	Rosie
25	USFS	5S	44E	25	CCC*	1938	3900	0.1	-	Soap
26	N. Woodward	5S	44E	27	DBD	1949	3540		S	-
27	USFS	5S	44E	29	BAB	1938	3900	1.0	S	-
28	USFS	5S	44E	33	CAC*	1937	3880	0.25	S	-
29	USFS	5S	44E	34	AAA	1940	3540	0.5	-	Water Gap

Table III-7.--Springs in and adjacent to Montco's life-of-mine-area--Continued

2I.D.[1] No.	Owner	Location[2] T	R	S	QQQ	Date filed	Elevation[3] (ft)	Flow (gpm)	4 Use	Name/ comments
30	SFS	5S	44E	35	CCC	1938	3740	0.6	-	Low Big
31	USFS	5S	44E	35	BDD	1938	3720	0.5	-	Old Road
32	USFS	5S	44E	36	ACD*	1963	3740	0.6	S	Butch
33	USFS	4S	44E	35	BAA*	1938	3540	0.5	-	McKelvey
34	USFS	4S	44E	36	DBB*	1938	3750	0.5	-	Black Canyon #2
35	McKelvey	4S	44E	5	DC	-	3000	2-5	S	McKelvey

1 Located on figure III-2.

2 B A Reads largest to smallest quarter section. In some cases (*) location description was altered from description in records to coincide with spring location indicated
C D on topographic map.

3 All elevations determined from location on topographic map.

4 Use: S = Stock.
Forest Service springs generally used May 1 to December 1 annually.

5 Used before 1920.

A summary of ranges of surface water quality for the mine plan area is shown on table III-8. Generally, water quality is typical of south-eastern Montana, although the Tongue River is of higher quality than other perennial streams in the region.

With few exceptions, water quality for springs in the Montco life-of-mine area exceeds recommended Federal standards for drinking water in sulfate and total dissolved solids. The springs are unsuited for irrigation purposes; however, spring water is typically acceptable for stock use.

Surface runoff impounded in stock ponds in the area varies significantly in quality throughout the year. Generally, water quality is best in the spring, following snowmelt accumulations.

Runoff samples collected from ephemeral tributaries to Tongue River occasionally exceed Federal drinking water standards for iron, manganese, sulfate, and total dissolved solids, although the water quality frequently meets all drinking water standards.

The Tongue River exhibits good water quality under most conditions, although total dissolved solids and sulfate concentrations exceed Federal drinking water standards about two thirds of the time. A medium salinity hazard exists when such water is used for irrigation, although it is readily used for irrigation without apparent adverse effects on crops.

Sediment yield from the North King unit is estimated by Montco to be about 450 tons per square mile per year (mi^2/yr). Assuming an average value of 100 pounds per cubic foot of sediment, this is equal to about 0.2 acre-feet per square mile per year ($AF/mi^2/yr$). This is a reasonable estimate when compared to a generally accepted average for the region of 0.5 $AF/mi^2/yr$ used by the Soil Conservation Service, or 0.035 $AF/Mi^2/yr$ calculated by Ringen and others (1979). Sediment yield rates for the remainder of the mine plan area probably also fall within this range.

Based on field observations and data submitted by Montco, DSL has determined that the Tongue River is an alluvial valley floor (AVF) under Montana and Federal mining laws. No areas identified by DSL as being in the Tongue River AVF are included within Montco's North King mining unit, although Montco proposes facilities construction on a small acreage of irrigated fields within the Tongue River AVF. The determination by DSL concerning the Tongue River AVF applies only to that portion of the valley adjacent to the North King unit and the proposed facilities area.

3. Ground Water

Within and adjacent to Montco's North King mining unit there are several ground-water-bearing zones which are, in descending order, alluvium underlying King Creek and Tongue River, Middle Knobloch and and Middle Knobloch-McKelvey clinker, Middle Knobloch coal seam, and McKelvey coal seam. Other aquifers, the Tullock member of the Fort Union Formation, the Hell Creek Formation, and

Table III-8.--Typical water quality

Parameter	Units	Project area springs		NCIR[1] springs		Stocks ponds		Project area streams		NCIR[1] streams		Tongue River	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
ph		7.5	8.2	8.2	9.2	6.9	9.7	6.8	8.2	6.1	8.0	7.9	8.6
Specific conductance	micromhos/cm @ 25°	1440	11200	1090	3150	91	2630	105	1060	126	1826	460	1000
Sulfate	mg/l	678	4840	<1	1035	6	1630	9	507	4	530	101	295
Total alkalinity	mg/l $CaCO_3$	204	895	157	1380	23	285	39	104	29	166	91	278
Heavy metals	mg/l	<1	<1	<1	<1	<1	<1	<1	<3	<1	<2	<1	<1

[1]NCIR, Northern Cheyenne Reservation, west side of Tongue River.

the Madison Group occur at greater depths. The latter unit has not been affected by mining in the region and is not discussed further. The Hell Creek Formation is known to be a reliable source of ground water of good quality in the Tongue River Valley (Hopkins, 1973). It is too deep to be directly affected by surface mining, and because of its depth has not been intensively developed.

The most important aquifers in the immediate vicinity of the North King unit, in terms of water quality and existing and potential water use, are the Hell Creek Formation and the Tullock. Available evidence indicates that the Middle Knobloch and the McKelvey coal seams are recharged in the uplands of Custer National Forest to the east and southeast of the North King unit, as well as from the King Creek alluvium, and discharge to the Tongue River alluvium to the northwest. Ground-water flow in these units is to the northwest. Aquifer tests indicate that these coal seams are of low permeability and that combined ground-water flow in these seams through the North King unit approximates 4 gallons per minute (gpm), or 0.009 cfs.

Ground water in the coal seams is generally under confined conditions, and at least some portions of the Knobloch seams are fully saturated throughout the entire mine plan area. Where present, the McKelvey and Nance coal seams are saturated throughout the life-of-mine area.

Recharge to the coal seams occurs in the uplands of the Custer National Forest to the southeast. Ground water flow in the coals is northwestward to the Tongue River, where discharge is directly or indirectly to the Tongue River alluvial system. Permeabilities within the coal seams vary throughout the life-of-mine area and tend to increase toward the southwest.

Available information suggests that little ground water occurs in King Creek alluvium down-valley from where Middle Knobloch clinker subcrops to the alluvium in the southeast corner of section 9 and northeast corner of section 16. Alluvial ground-water appears to be lost to the general ground water flow northwestward through the North King unit; thus, little or no ground water from King Creek Valley discharges directly to Tongue River alluvium.

The hydrogeologic significance of clinker (scoria) units in the North King unit is uncertain. Woessner and others (1981) dicuss clinker's regional importance to shallow ground-water systems in the Fort Union Formation, and Stiller (1979) has suggested that even small areas of clinker may be of local hydrogeologic significance. The major exposure of Middle Knobloch and McKelvey clinker within the North King unit suggests that rapid recharge probably occurs locally from direct precipitation and snowmelt. Ground-water movement within the clinker is highly irregular and unpredictable, due to the irregular subsurface contact between the clinker and underlying bedrock units. However, field observations of vegetative vigor suggest that flow within this clinker area is northwestward toward the Tongue River Valley.

This clinker exposure in the North King unit may be a major recharge area for the McKelvey Spring which discharges from its base in the west side of the unit. However, constancy of water quality throughout the seasons of the year and a relatively constant spring discharge rate suggest a more regional source for the spring. The Middle Knobloch and McKelvey Spring, and water chemistry comparisons suggest a similarity between McKelvey Spring water and ground-water samples taken from a nearby observation well completed in the McKelvey coal seam. Accordingly, it is thought that the McKelvey Spring's source is at least in part the McKelvey coal seam.

Alluvium underlying the Tongue River is composed of sediments of varying lithologies up to cobble size, while alluvium of the ephemeral tributaries is composed of local sedimentary rock types and contains much clinker. These alluvial aquifers generally have water table systems. Ground-water flow through the Tongue River alluvial aquifer is estimated at 350 gpm.

The Tulloch Member of the Fort Union Formation is a source of water to wells in the area. Locally, this unit is called the Lance aquifer. The Lance aquifer is composed of as much as 200 feet of sandstone. The top of the Lance aquifer is about 500 to 600 feet below land surface in the area of the North King unit.

The Hell Creek aquifer of Cretaceous age is also an important source of water supply. The Hell Creek aquifer is at depth of about 1,100 to 1,300 feet below land surface in the area. It is a sandstone unit that will yield as much as 200 gallons per minute to properly constructed wells. The artesian head in this aquifer may be sufficient to cause wells to flow in low areas along the Tongue River. Water wells in the Montco life-of-mine area are shown on figure III-2. At least three wells (numbers 30, 33, and 57) lie within the proposed facilities area and the North King unit.

Ground water in the Montco life-of-mine-area is generally potable and suitable for most purposes, although poor quality water may occur in discrete areas. Most wells in the coal aquifer yield water with very high concentrations of total dissolved solids, sulfate, and fluoride. The water in the coal aquifers generally renders the water unsuitable for drinking water use. Table III-9 provides ranges in selected water quality parameters for four types of wells in the area. Water from alluvial aquifers represents the highest quality ground water in the area. Many homeowners' wells are completed in Tongue River alluvium or in bedrock units well below the coal seams. Although the total dissolved solids content of water from all homeowners' wells exceeds standards, these waters do not appear to present health hazards because individuals apparently adjust to such concentrations.

Table III-9.--Typical ground-water quality, Montco life-of-mine-area

Value	Units	Alluvial aquifers		Coal and interburden aquifers		Homeowners' wells		Lance aquifers wells	
		Low	High	Low	High	Low	High	Low	High
pH		6.9	7.6	6.9	10.1	7.1	8.2	7.9	8.4
Specific conductance	micromhos/cm @ 25°C	1050	2485	1660	7895	1129	1880	1165	1990
Sulfate	mg/l	15	519	2	3670	<1	263	<1	2.0
Total alkalinity	mg/l $CACO_3$	363	1290	413	1570	375	1160	286	1080
Heavy metals	mg/l	<1.0[1]	<1.0[1]	<1.0[1]	<1.0[1]	<1.0	<1.0	<1.0	<1.0

[1]Except iron.

C. SOILS

1. Summary

The soils of the Montco Mine plan area vary widely in their depth, texture, color, profile morphology, coarse fragment content, and salt and sodium content. This diversity reflects the variability of topography, parent materials, vegetation, and past land uses.

2. General Overview

Lowlands of the mine plan area are characterized by alluvial soils of the Tongue River flood plain and its major tributaries. The soils are generally deep, occur on nearly level or gently sloping areas; range from gravelly and sandy loams to clays, and are very poorly to well drained. They vary in their sodium adsorption ratios (SAR--an indicator of sodium content) and electrical conductivities (EC--a measure of soluble salt content). Carbonates are common in the C (lower) horizons.

Uplands of the Montco Mine plan area consist primarily of residual, colluvial, or locally derived alluvial soils. A significant portion of these soils are shallow (less that 20 inches) or moderately deep (20-40 inches), are poorly developed, may contain abundant coarse fragments; and occur on moderate to very steep slopes (15 to 70 percent). They are principally derived from shales, sandstone, siltstone, and clinker; are commonly calcareous in the C horizons; contain various quantities of sodium and soluble salts; and are usually well to excessively drained. On the benches and plateaus, deeper soils and gentler slopes are common.

The information contained here on soils in the Montco mine plan area comes from a study that took place from September 1979 to April 1980. At this time Montco conducted an intensive (Order I) soil survey on about 10,000 acres in the northern portion of the Montco Mine plan area, including the proposed facilities area and the proposed North King, South King, North O'Dell, and South O'Dell mining units. Montco has not yet--but must before submitting a site-specific permit application--map the South Gate unit at an Order I (intensive) level. The area has been mapped less intensively (Order III) by the Rosebud County Soil Survey Staff, U.S. Soil Conservation Service. The Rosebud County Soil Survey is not scheduled to be published until late 1985.

3. North King Mining Unit

About 500 acres in the North King unit would be disturbed by mining and related activities. A topsoil stockpile would occupy approximately 7 acres within the North King unit bringing the total acreage disturbed in the unit to about 502 acres. Soil would be salvaged from the 495 acres within the North King unit. The 495 acres of soil to be salvaged consist of 39 percent deep loams and clay loams, 38 percent moderately deep loams and sandy loams, and 19 percent shallow loams and sandy loams. Rock outcrop, disturbed land, and water would account for 3 percent of the area and the topsoil stockpile would occupy 1 percent of the North King Unit.

The major factor limiting land use in this area is erosion, mostly from dissected topography and periodic drought. In addition, the vegetative productivity of these soils is low--600 to 1,000 pounds per acre--and the soils are only poorly to moderately well developed. None of the soils meet the criteria for prime farmland.

4. Proposed Facilities Area

Soils in the proposed facilities area and the railroad transportation corridor are similar to those in the proposed North King unit. Of the approximately 169 acres that would be disturbed, soil would be salvaged from about 133 acres. Topsoil stockpiles account for the remaining 36 acres. The 133 acres of soil to be salvaged consist of 68 percent deep soils, 14 percent moderately deep soils, 10 percent shallow soils, and 8 percent rock outcrop, talus, and disturbed land. The deep soils consist primarily of loams and sandy loams as do the moderately deep soils. The shallow soils to be salvaged also consist of loams and sandy loams.

About eight acres of potential prime farmland soils would be removed during railroad loop construction. Another nine acres lie within the loop but would not be disturbed. The eight acres comprise three soil mapping units--the Havre loam, Harlem clay loam, and Glendive sandy loam--classified by the U.S. Soil Conservation Service as prime farmland soils if irrigated.

Montco intends to include within its permitted and bonded area the part of the Tongue River Railroad mainline corridor adjacent to its double-track loop. The soil material removed prior to construction would be used as fill and growth medium for reclamation of the cut slopes.

D. VEGETATION

1. Summary

Grasses typical of the northern Great Plains dominate the Montco study area. The three major wildlife habitat communities, riparian, coniferous, and upland bench, are described under section F-8 of this chapter.

2. Vegetation Study Area

a. Species Occurrence

Data were collected in 1977, 1978, and 1979 to produce a vegetation baseline inventory for the 25,000-acre Montco vegetation study area (CEAR, 1980). Other vegetation studies and inventories have also been conducted on or near the area (Batson and Elliott, 1975; Morris and Lovegrove, 1975; Taylor and others, 1975; and Brown, 1971).

Grasslands typical of the northern Great Plains dominate the study area. Western wheatgrass (Agropyron smithii) and blue grama (Bouteloua gracilis) are dominant, with needle-and-thread (Stipa comata) and bluebunch wheatgrass (Agropyron spicatum) common on coarser soils. Big sagebrush (Artemisia tridentata) is abundant on uplands and "breaks" (steep, highly eroded slopes). Drainage bottoms often support stands of silver sagebrush (Artemisia cana) with an understory of western wheatgrass. Greasewood (Sarcobatus vermiculatus) occurs in extensive stands on river terraces.

On steep slopes, coarse soils derived from sandstone or scoria support little bluestem (Schizachyrium scoparium; syn. Andropogon scoparius), sideoats grama (Bouteloua curtipendula), bluebunch wheatgrass, and skunkbush sumac (Rhus trilobata). Ponderosa pine (Pinus ponderosa) and Rocky Mountain juniper (Juniperus scopulorum) form stands where the sites are moderately moist.

Dominant species on badlands include big sagebrush, shadscale saltbush (Atriplex confertifolia), greasewood, and bluebunch wheatgrass. Stands of Rocky Mountain juniper are found where these sites are moderately moist.

Deciduous forest dominated by plains cottonwood (Populus deltoides), box elder (Acer negundo), and green ash (Fraxinus pennsylvanica) is common on the Tongue River bottomland.

Five major flora, or groups of plants from a particular region, make up the study area. Mixed prairie species are dominant. Tall grass prairie species grow on localized sites with higher available moisture. Ponderosa pine, Rocky Mountain juniper, and skunkbush sumac--all derived from the Rocky Mountain flora--are also found on localized sites where soil and topographic factors increase available moisture. Species of the Great Basin flora are abundant. Shadscale saltbush, Nuttall saltbush (Atriplex nuttallii), greasewood, fringed sagewort (Artemisia frigida), yucca (Yucca glauca), alkali saltgrass (Distichlis stricta), winterfat (Ceratoides lanata), and sagebrush species (Artemisia spp.) are conspicuous examples. A few boreal forest species, such as serviceberry (Amelanchier alnifolia) and red-osier dogwood (Cornus stolonifera), grow in small amounts.

b. Rare or Endangered Species

Over three field seasons of vegetation mapping, no plants were found that are listed as rare or endangered by Ayensu and De Fillips (1978), Dorn (1977), or Watson (1976). Because of the intensity at which the vegetation was inventoried, populations of rare or endangered plants probably do not grow within the vegetation study area.

c. Ethnobotany

The use of native plants by Northern Cheyenne in or near the Montco vegetation study area has not been extensively studied; however, 25 plant species found in southeastern Montana were reported to be used by the Northern Cheyenne Indians (Hart and Moore, 1979). (See table III-10.)

Table III-10.--Plant species of Southeastern Montana used by the Northern Cheyenne Tribe

Common name	Scientific name	Brief description of use
box elder[1]	Acer negundo	Making sacred utensils.
western yarrow[1,2]	Achillea millefolium	Medicine; religious ceremonies.
red baneberry	Actaea rubra	Medicine; religious ceremonies.
green ash[1]	Fraxinus pennsylvanica	Construction, handiwork.
red-osier dogwood[1]	Cornus stolonifera	Smoking, arrows.
pineapple weed[1]	Matricaria matricarioides	Perfume.
eastern lomatium[1]	Lomatium orientale	Medicine.
rush skeletonweed[1]	Lygodesmia juncea	Medicine, tea.
sweetgrass	Hierochloe odorata	Incense;religious ceremonies.
curlycup gumweed[1]	Grindelia squarrosa	Medicine.
American licorice[1]	Glycyrrhiza lepidota	Medicine, chew.
Rocky Mountain juniper[1,2]	Juniperus scopulorum	Medicine, bows; religious ceremonies.
purple coneflower[1]	Echinacea pallida	Medicine.
plains pricklypear[1]	Opuntia polyacantha	Food.
kinnikinnick[1]	Arctostaphylos uva-ursi	Medicine; religious ceremonies.
choke cherry[1,2]	Prunus virginiana	Medicine, food.
cudweed sagewort[1]	Artemisia ludoviciana	Medicine, religious ceremonies; incense.
ponderosa pine[1,2]	Pinus ponderosa	Gum, handiwork.
rose[1,2]	Rosa spp.	Medicine, tea.
field mint[1]	Mentha arvensis	Tea, perfume, aphrodisiac.
yampa	Perideridia gairdneri	Food.
showy milkweed[1]	Asclepias speciosa	Medicine, gum, food.
willow[1]	Salix spp.	Medicine, religious ceremonies.
eastern cottonwood[1]	Populus deltoides	Construction, animal food, paint; religious ceremonies.
horsemint[1]	Monarda fistulosa	Horse perfume.

[1]Included in list of species found in the 25,000-acre Montco vegetation study area.
[2]Included in Montco's revegetation plan.

Many of the plant species listed in table III-10 are common throughout southeastern Montana. Three species, however, were not found on the study area during field surveys. The first, red baneberry (Actaea rubra), would be expected to occur in moist streambank habitats; it probably was overlooked in the dense growth along the Tongue River. The second, sweetgrass (Hierochloe odorata) is uncommon in southeastern Montana. The third, yampa (Perideridia gairdneri), has been greatly reduced in abundance due to extensive gathering by Northern Cheynne (OEAR, 1981); the entire root system is dug up for food, so harvesting is extremely destructive.

3. Proposed Permit Area

a. Overview

Of the 14 vegetation community types mapped on the 25,000-acre study area, ten were found in the proposed permit area (North King mining unit and facilities area). (Table III-11 lists these plus six other land types.)

Most community types are named for their dominant species, but there are a few exceptions. The "breaks complex" is dominated by big sagebrush, shadscale saltbush, greasewood shrubs, bluebunch wheatgrass, western wheatgrass, little bluestem, and Japanese brome grasses (Bromus spp.). The big sagebrush/bunchgrass community type includes, as its major bunchgrass, either bluebunch wheatgrass or needle-and-thread. The "sidehill complex," so named because of the variability of proportions of dominant species, usually contains little bluestem, sideoats grama, bluebunch wheatgrass, blue grama, and needle-and-thread.

The most widespread vegetative community found in the proposed permit area is the ponderosa pine/juniper/bluebunch wheatgrass type. This community is actually an ecotone (transitional community) between a juniper/bluebunch wheatgrass community and a ponderosa pine/bluebunch wheatgrass community.

The remaining vegetation types in Table III-11 are self-explanatory, except for the following: the agricultural land type differs from the crested wheatgrass type in that it is irrigated; the crested wheatgrass is dryland farmed. The area mapped as "water" consists of stock ponds and abandoned stream meanders. "Weed" consists of undesirable plant species, probably the result of overgrazing. "Homestead" consists of abandoned buildings and corrals that are part of an old homestead.

b. Range Condition and Recommended Stocking Rates

At present, the range condition of the proposed permit area is "low good," indicating a productivity level about 51 percent of climax vegetation. The range trend is stable. The recommended stocking rate (RSR) (not including agricultural or disturbed areas) is 231 cow-calf units for a one-month grazing period, or 26 cow-calf units for a nine-month period. The potential RSR is 241 cow-calf units for a one-month grazing period, or 27 cow-calf units for a nine-month period (assuming high-good range condition, or a production level of about 75 percent of climax vegetation).

E. AQUATIC BIOLOGY

1. Summary

Aquatic populations within the mine plan area are limited both in number and species diversity. The populations are restricted to several

Table III-11.--Vegetation community types and proposed acreages to be disturbed in the facilities area, North King mining unit, and permit area, and proposed total disturbed and undisturbed acreages in the permit area

Vegetation type	Facilities area (disturbed)			North King mining unit (disturbed)	Permit area	
	Transportation corridor	Other	Total		Disturbed	Disturbed and undisturbed
Ponderosa pine/juniper /bluebunch wheatgrass	7.06	12.15	19.21	95.49	114.70	336.33
Breaks	0.00	2.09	2.09	70.00	72.09	80.43
Silver sagebrush/ western wheatgrass	4.07	5.95	10.02	0.17	10.19	61.76
Greasewood/ western wheatgrass	0.00	5.35	5.35	4.59	9.94	11.24
Big sagebrush/ western wheatgrass	2.08	12.42	14.50	125.04	139.54	160.61
Big sagebrush/ bunchgrass	0.28	8.07	8.35	92.27	100.62	128.78
Sidehill complex	14.04	5.14	19.18	46.04	65.22	157.71
Western wheatgrass/ blue grama	0.85	23.85	24.70	61.60	86.30	128.19
False tarragon sagewort/ needle-and-thread	0.00	1.63	1.63	0.00	1.63	3.67
Needle-and-thread/ blue grama	8.89	28.24	37.13	4.66	41.79	133.71
Agricultural	3.03	19.09	22.12	0.00	22.12	49.33
Rock outcrop/cliff	0.00	1.16	1.16	0.00	1.16	3.07
Crested wheatgrass	0.79	2.93	3.72	0.00	3.72	14.69
Water	0.00	0.00	0.00	1.84	1.84	1.84
Weed	0.00	0.00	0.00	0.00	0.00	0.23
Homestead	0.00	0.23	0.23	0.00	0.23	2.29
Totals	41.09	128.30	169.39	501.70	671.09	1,273.88

springs and manmade structures (stock ponds and water troughs). The Tongue River lies adjacent to the life-of-mine area and is of good quality compared to other streams in the area.

2. Description of Aquatic Biota

The aquatic ecology of the Tongue River and its tributaries near the proposed Montco life-of-mine area has been described in studies undertaken by the Montana Department of State Lands and U.S. Department of the Interior (Tongue River Petition Evaluation Document, 1982), Montana Department of Fish Wildlife and Parks (Elser and McFarland, 1977), Gore (1976), and others. Montco presented the results of a one-year study of the aquatic ecology of the proposed mine area in their permit application.

The algae, macroinvertebrates, and fish populations of the surface waters on and near the Montco life-of-mine area were sampled and analyzed. Total dissolved solids, total suspended solids, oxygen content, pH, and temperature were monitored over a one-year period. A survey of aquatic macrophytes was also completed by the Montana Water Quality Bureau (Regele and others, 1982).

The Montco life-of-mine area (fig. III-2) spans eight drainages. King Creek is the northernmost; Poker Jim Creek is the southernmost. Watershed acrages for seven of the eight are presented in Table III-6.

Mining activity is proposed to begin in the King Creek drainage and progress southward through O'Dell Creek; the final cuts would take place at the mouths of Poker Jim and Poker Teechee Creeks.

All of the creeks in the mine plan area are ephemeral. An ephemeral stream, as defined by the Department of State Lands (DSL), flows only in direct response to precipitation in the immediate watershed or the melting of a cover of snow or ice, and has a channel bottom that is always above the local water table.

With the exception of one spring, the only constant water sources in the North King mining unit are stock ponds and watering troughs. Flows from these average 0.01 cubic foot per second (cfs). Overflows run 80 to 150 yards down creek bottoms. Usually the wet zone is only 6 inches wide and about 0.5 inch deep. Small pools may also exist.

Because all streams in the mine plan area are ephemeral, aquatic flora and fauna are limited to organisms tolerant to short-lived water occurrences, low flows, and high temperatures. In general, fewer kinds and numbers of plants and animals are present in these ephemeral drainages than in areas with perennial flows. Table III-12 presents a list of the organisms found during the aquatic surveys. With the exception of two species, all organisms collected are adapted to life in temporary ponds or slow-moving, brackish water.

Table III-12.--Taxa collected from ephemeral drainages on the Montco project area

I. Insecta
- Ephemeroptera
- Diptera
  - Baetidae
    - Callibaetis sp.
- Odonata
  - Coenagrionidae
    - Amphiagrion abbreviatum
- Hemiptera
  - Corixidae
    - Cenocrixa utahensis
    - Sigara sp.
  - Gerridae
    - Gerris sp.
    - Gerris bueoni
    - Gerris remigis
  - Notonectidae
    - Notonecta undulata
- Coleoptera
  - Dytiscidae
    - Agabus sp.
    - Derovatellus sp.
    - Rhantus sp.
    - Oreodytes sp.
  - Hydrophilidae
    - Hydrobius sp.
    - Tropisternus sp.
    - Ametor sp.
    - Helophorus sp.
    - Berosus sp.
  - Haliphlidae
    - Haliphlus sp.
  - Chrionomidae
    - Psectrotanypus sp.
    - Diamesa sp.
    - Dhironomus sp.
    - Acricotopus sp.
    - Cricutopus sylvestris
  - Culicidae
    - Culex sp.
    - Psorophora sp.
  - Simuliidae
    - Simulium sp.
- Nematomorpha
  - Gordidae
    - Gordius sp.

II. Mollusca
- Gastropoda
  - Lymnaeidae
    - Lymnaea spp.

All eight of the streams in the proposed mine plan area drain northwesterly to the Tongue River, which flows alongside the life-of-mine area. The Tongue River is unique within the area: it contains relatively low levels of the sodium and sulfates characteristic of other rivers in the Ashland area. It also drains a large area, with the Tongue River Dam maintaining year-round flow and acting as a settling pond to remove silt from upstream disturbances. As a result, the flora and fauna of the river are more typical of western than eastern Montana.

The diversity of the algae in the Tongue River has been described as good (Bahls and others, 1980), with dominant species capable of tolerating a wide range of environmental conditions. Complete taxa lists are included in the permit application. Abundant diatom species include Achnanthes minutissima, Cymbella affinis, Rhoicosphenia curvata, Cocconeis placentula, Gomphonema angustatum, Navicula tripanctata, and Nizschia spp. Common macrophytes found in the river are Potamogeton spp., Veronica sp. Catabrosa sp., and Sagittaria sp. The most abundant macroinvertebrates present are the beetles (Microcylloepus pusillus), caddis flies (Hydropsyche spp.), mayflies (Ephemerella spp.), and members of the true flies (Simulium spp. and Chironomus spp.).

The Tongue River bed is composed mostly of sand, gravel, and cobbles; silt makes up slightly over 10 percent of the area. Gravel and cobbles offer better habitat than sandy and silty substrates, and therefore support a much more diverse population of aquatic insects. Moreover, many species of fish, such as the smallmouth bass often found in the area, usually nest on a gravel base. In general, in the Tongue, gravel and cobbles make up 50 to 80 percent substrate and are most common in reaches adjacent to the northern end of the life-of-mine area. Sand is a major part of the bottom only within the stretches near the southern end of the life-of-mine area and is less common downstream toward the northern end of the area.

Pools and runs are the two most common habitat types adjacent to the Montco life-of-mine area. Together, these habitats compose approximately 80-90 percent of the river area. Runs, characterized by flows in excess of one foot per second and depths greater than 0.8 foot, are by far the most common single type, making up over half of the river area. Other habitats found within the stretches examined were riffles and shallow, slack-water areas, together making up only 10-15 percent of the river area.

Tongue River fisheries were studied from Hanging Woman Creek (5 aerial miles south of the life-of-mine area) to Otter Creek (just north of Ashland) by the Montana Department of Fish, Wildlife and Parks. Table III-13 presents a list of species found at that time. In general, larger individual fish were found within upstream stretches and smaller fish were downstream. The shorthead redhorse was captured in the greatest numbers and had the highest biomass in all areas sampled. Game fish such as smallmouth bass and northern pike were less abundant and therefore more difficult to sample. Smallmouth bass were the most important game fish found in the sample area. Approximately ten smallmouths were found per 0.62 mile (1 kilometer) of river during fall 1978. Smallmouth in the Tongue River exhibited better growth rates than those in the Tongue River Reservoir, particularly during ages 1-3. Growth of smallmouth in the Tongue River is slower than in the reservoir after age three. Young smallmouth bass were found to usually feed on aquatic insects; older bass were found to feed on small yellow perch, crappies, and other small fish. Most young smallmouth bass had reached 100 millimeters in length by the end of the first growing season.

Table III-13.--Common and scientific names of fish captured near the Montco life-of-mine area

Common name	Scientific name
yellow perch	Perca flavescens
northern pike	Esox lucius
carp	Cyprinus carpio
longnose dace	Rhinichthys cataractae
flathead chub	Hybopsis gracilis
lake chub	Couesius plumbeus
fathead minnow	Pimephales promelas
golden shiner	Notemigonous crysoleucas
river carpsucker	Carpiodes carpio
longnose sucker	Catostomus catostomus
white sucker	Catostomus commersonnii
shorthead redhorse	Moxostoma macrolepidotum
mountain sucker	Catostomus platyrhynchus
stonecat	Noturus flavus
black bullhead	Ictalurus melas
channel catfish	Ictalurus punctatus
smallmouth bass	Micropterus dolomieui
pumpkinseed	Lepomis gibbosus
green sunfish	Lepomis cyanellus
black crappie	Pomoxis nigromaculatus
white crappie	Pomoxis annularis
rock bass	Ambloplites rupestris
walleye	Stizostedion vitreum
sauger	Stizostedion canadense

Other game fish were not found in sufficient numbers for population estimates or other life history characteristics; however, the northern pike was found to use the mouth of Hanging Woman Creek extensively for a spawning area. Life history characteristics of less important fishes such as the rock bass can be found in the permit application, on file with DSL.

Water quality characteristics monitored during a study completed for the permit application included temperature, dissolved oxygen (DO) biochemical oxygen demand (BOD), total suspended solids, chemical oxygen demand (COD), pH, electrical conductivity, and nitrogen and phosphorus content. The amount of oxygen available to organisms is an important characteristic of streams. Game fish populations require 5 parts per million (ppm) dissolved oxygen to reproduce; they will die if the level drops below 3 ppm. The Tongue River appears to have adequate oxygen: the lowest concentration recorded, during winter, was 9.8 ppm and the samples for BOD and COD resulted in low values characteristic of unpolluted streams.

The pH or acid/base condition of the water of the Tongue River ranged between 8.0 and 9.1, typical of most eastern Montana streams. Nitrogen and phosphorus, essential nutrients for plant growth, were generally found to be low but cyclical. Higher concentrations occurred during winter months when plant activity was reduced. Phosphorus content was low to moderate and at a relatively constant level throughout the year.

Total dissolved solids in the river were seasonal; they depended on the base flow and runoff. The highest concentration occurred during April 1979, prior to spring runoff. Later in the season, that level is diluted by melting snow, ice, and added precipitation.

Since aquatic communities are influenced by water temperature, profiles were taken during the ice-free period. Water temperature peaked at about 75° Fahrenheit during the late summer and early fall periods. Freeze-up occurred during early to mid-November. In general, the water becomes warmer as it flows downstream. The lower stations recorded temperatures approximately 2.5° Fahrenheit warmer than upstream stations.

F. WILDLIFE

1. Summary

Wildlife populations in the life-of-mine area are characterisitic of southeastern Montana. Mule deer is the most common big game species, ring-necked pheasant and sharp-tailed grouse the most common upland gamebirds.

One hundred and fifty-five bird, 34 mammal, 7 reptile, and 4 amphibian species were recorded at some time during the surveys. (See appendixes 2, 3, and 4 for a species list.) A wildlife habitat type map and special features map (i.e. rockpiles, cliffs, etc.) are presented in the permit application. (This section was based primarily on 1978-80 field survey data presented in the Montco mine permit application.)

2. Big Game

Big game species found within the life-of-mine area included mule deer, pronghorn, and white-tailed deer. Mule deer were by far the most abundant: at one time a total of 336 were counted in the life-of-mine area. In addition, Knapp (1977) estimated that there were 4.3 deer per square mile in a region adjacent to and overlapping the mine plan area. Pronghorns were much less common than mule deer, both in distribution and number. The largest concentrations were seen during the severe winter of 1978-79, when approximately 60 animals were sighted one-half mile north of the proposed North King mining unit. A minimum of 33 white-tailed deer were seen during a February survey.

3. Gamebirds

Gamebirds on the life-of-mine area included the ringed-neck pheasant, sharp-tailed grouse, gray partridge, Hungarian partridge and sage grouse. Pheasant were the most abundant upland gamebird within the area, most often being sighted in riparian habitat, less frequently on a brushy draw and hillside north of King Creek. Winter distribution was restricted to riparian habitat. Most sharptailed grouse were seen in the sage/grassland habitats (both big and silver sage) and the perennial grassland habitats during spring, summer, and fall. Sightings in the riparian and coniferous wooded types increased during fall and peaked during winter. Six established dancing grounds, and one additional possibly forming, were found outside the life-of-mine area during the field survey. During the year the birds were surveyed, most of the grounds contained an average of 10-14 dancing males; the largest ground contained 20 active males. Few Hungarian partridge, gray partridge, or sage grouse were seen. A small population of turkeys inhabits pine forests east of the life-of-mine area.

Waterfowl were restricted to stockponds within the mine area and the Tongue River adjacent to the area. Five Canada goose broods were documented on the Tongue River; a brood of eight blue-winged teal was counted on the Cedar Creek stockpond; and three merganser broods were seen on the river. Waterfowl densities peaked during the spring and fall migration periods.

4. Raptors

Twenty-one species of eagles, hawks, vultures, and owls were observed in or around the life-of-mine area. These varied from year-round residents, such as golden eagles and great horned owls; to summer residents, such as Cooper's hawks, prairie falcons, and turkey vultures; to winter residents, such as rough-legged hawks; to spring and fall migrants, such as osprey. Seven red-tailed hawk nests and two great horned owl nests were located along the Tongue River. Another red-tail pair nested near the southern boundary of the proposed permit area. An active prairie falcon nest was discovered about 1 mile east of the life-of-mine area. (Pat Farmer, Westech, oral commun., January 11 and 13, 1984.)

5. Threatened and Endangered

Two threatened or endangered species were observed in the study area. On March 23, 1979, a positive sighting of a peregrine falcon was recorded near the mouth of King Creek. A subsequent intensive search for peregrines found that no birds were nesting in the area; however, the survey did indicate that good foraging habitat was present. Although many adequate nesting cliffs were located, none of the optimum sites were within the mine plan area.

Bald eagles were sighted, usually along the Tongue River, from fall through spring, most commonly during periods of ice-free river conditions. Lockhart et al. (1978) identified the Tongue River immediately below the Tongue River Dam as an important winter concentration area because it does not freeze over. Carrion is the major food source.

No black-footed ferrets or their sign were encountered during searches of prairie dog towns.

6. Nongame Birds

Resident nongame birds were inventoried by several methods. Since differing habitats contain both different species and densities, a sample of the monitoring study results is presented in Appendix 2

7. Small Mammals

Trap lines were used to assess density and occurrence of small mammals. Appendix 3 presents some of the common species captured and their relative densities. The deer mouse was found to be the most common mammal in the Montco study area in a variety of habitats. Miscellaneous observations documented the presence of prairie dogs, red squirrels, pocket gophers, white-tailed jack rabbits, and porcupines.

8. Major wildlife habitat types

The profusion of plant species on this area can be grouped into three major vegetative communities to aid in discussing wildlife use and mining impacts.

(1) The riparian community, occurring mainly along the Tongue River, consists predominantly of silver sage, greasewood, sod-forming grasses, agricultural plantings, and deciduous trees and shrubs.

(2) The coniferous community occurring along the breaks area and in stands scattered throughout the life-of-mine area, consists predominantly of ponderosa pine and juniper. The breaks are areas of rugged topography with little vegetative cover which consists of codominant shrubs such as shadscale, salt bush, and big sagebush.

(3) The upland bench community, occurring on plateaus or benches generally at an elevation above the breaks, consists of perennial grasses, big sagebrush, and bunchgrass. Some coniferous stands are located within this community.

G. CLIMATE

1. Summary

The semiarid climate at the site of the Montco Mine is typical of the Northern Powder River Basin: moisture is insufficient to support dense vegetative growth (Critchfield, 1966). Precipitation is low but variable, falling primarily during April through June. Diurnal and seasonal temperatures range widely. Surface humidity is low. Prevailing winds blow from the southwest and northeast, along the Tongue River Valley, and wind speeds are moderate, rarely calm. A regional EIS prepared by the U.S. Department of the Interior and DSL (1980) describes the climate in greater detail.

Meteorological data were collected for this EIS at a meteorological site on the proposed Montco mine site (fig. III-8) for one year, August 1979 through July 1980 (fig. III-9). This period is too brief to fully characterize the climate. Thus, data collected at Birney, 15 miles southwest, are used instead, unless otherwise noted.

2. Precipitation

During the 25-year period of 1955-1979, mean annual precipitation at Birney was 13.2 inches, ranging from 5.8 to 19.8 inches. Over 60 percent of this falls from May through September, the potential growing season. Winters are relatively dry (fig. III-9). Much of the annual precipitation, especially during June, falls in brief, intense thunderstorms (table III-14).

Effective precipitation, that is, water available for plant growth, soil formation, and erosion (Thornthwaite, 1937), is greatest in spring and early summer (fig. III-9).

On each of at least 90 days a year at least 0.01 inch of precipitation falls, an amount sufficient to control fugitive dust emissions during that day (EPA, 1975).

Table III-14.--Maximum amount of precipitation, in inches, expected at the Montco site during various time intervals

[Source: Miller and others, 1973]

Length of event (hours)	Number of years considered					
	2	5	10	25	50	100
1	0.7	0.9	1.2	1.4	1.7	1.9
6	1.0	1.3	1.5	2.0	2.2	2.4
24	1.4	1.8	2.2	2.8	3.0	3.4

3. Temperature

Mean annual temperature is about 44.5° F. During the monitoring period the Montco site had an average temperature of 47° F, warmer during almost all months than Birney (fig. III-9). The freeze-free period, the period temperatures remain above 32° F, was 151 days at Montco, probably longer than normal (Toy and Munson, 1978). The growing season, however, is effectively terminated during mid to late summer, due to drought-induced dormancy of vegetation. (Toy and Munson, 1978).

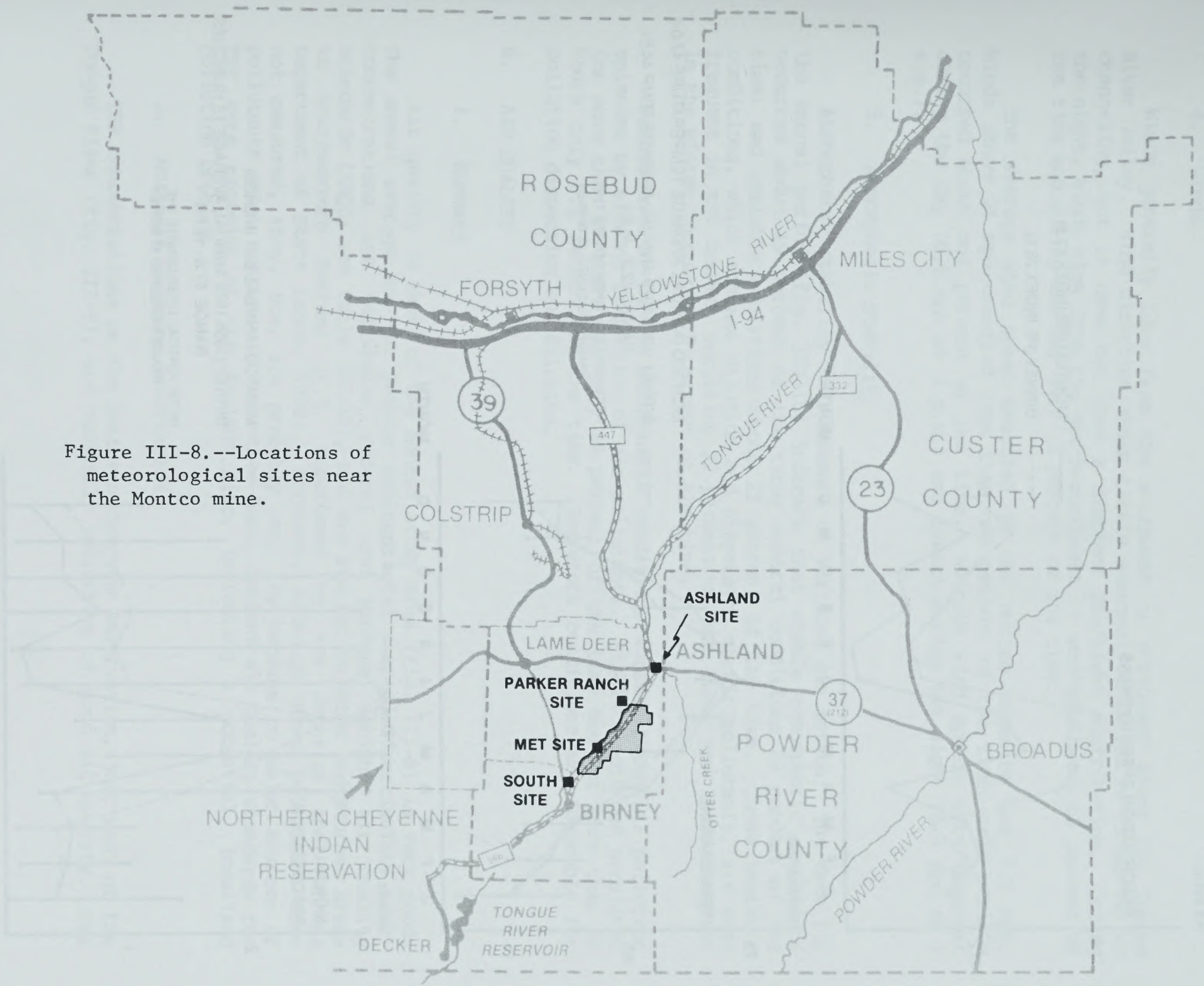

Figure III-8.--Locations of meteorological sites near the Montco mine.

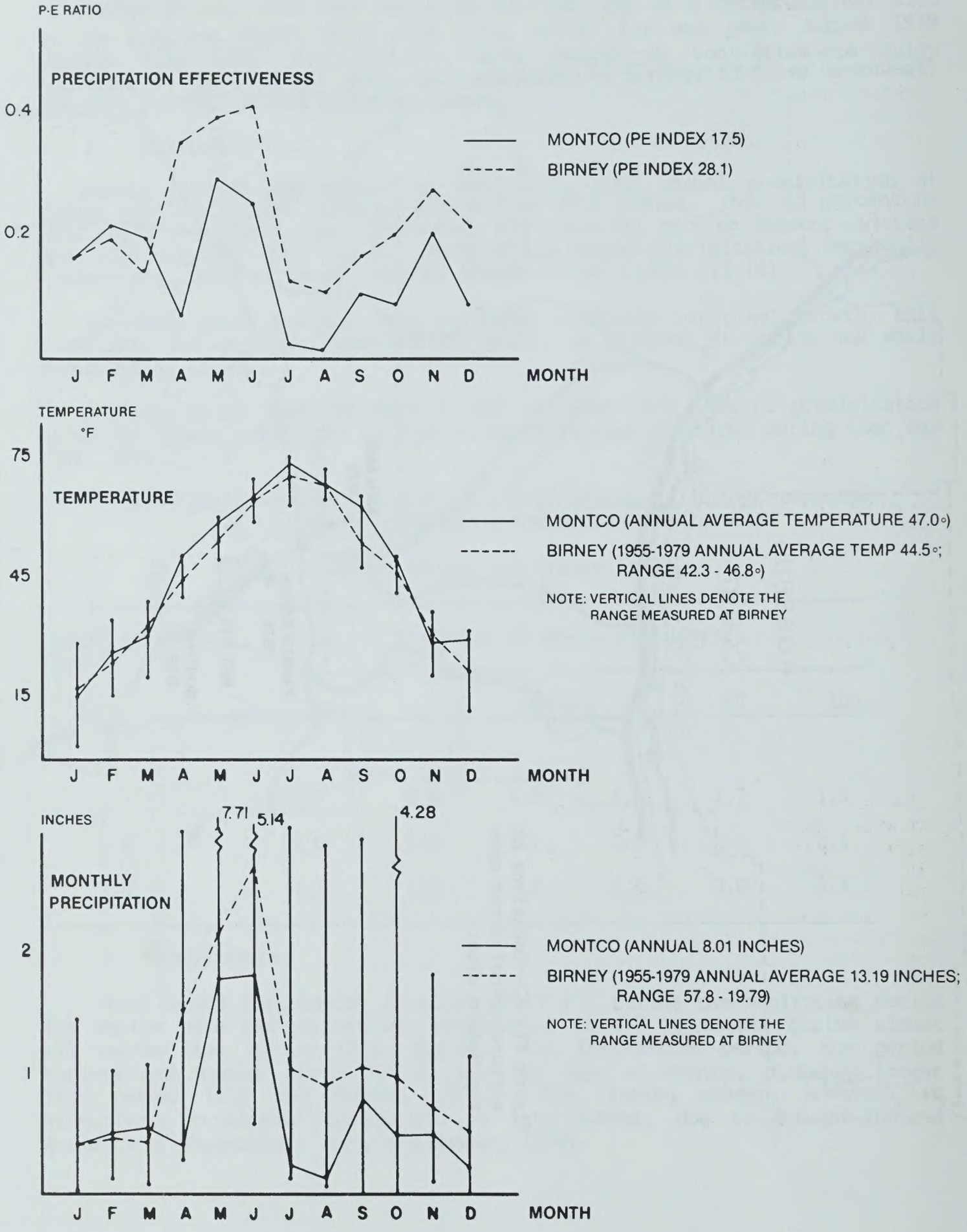

Figure III-9.--Climatic data for the Montco mine and the Town of Birney.

4. Winds

Winds generally blow from the southwest or northeast along the Tongue River Valley. Wind direction shows little seasonal variation or cross-valley channeling, but it does not show a distinct day/night distribution. During the night, winds blew from the south-southwest to west-southwest 68 percent of the time and during the day only 25 percent of the time.

The average wind speed measured at the Montco minesite was 7.2 mph. Winds above 24 mph occurred less than one percent of the time; calm periods occurred about one percent of the time. Average wind speeds were greatest during the day (8.8 mph at 3 p.m.) and lowest during the night (6.3 mph at 1 a.m.).

5. Atmospheric Stability

Atmospheric stability is a measure of vertical air motion. The data for the annual period (fig. III-10) indicate that stable atmospheric conditions occurred about 49 percent of the time; neutral conditions 29 percent of the time; and unstable conditions about 22 percent of the time. These unstable conditions, which enhance dilution and dispersion of air pollutants, are most frequent in the summer, occurring 30 percent of the time, and least frequent in the winter, occurring 9 percent of the time.

Persistence of stable atmospheric conditions worsens potential pollution episodes by slowing dispersion of air pollutants. Stable conditions persisted for more than 10 hours and only 25 percent of the time and for more than 18 hours only 0.2 percent of the time. Therefore conditions are favorable for pollution dispersion and dilution.

H. AIR QUALITY

1. Summary

Air quality in most of the Montco study area (fig. III-8) is very good. The annual average and the 24-hour maximum total suspended particulate (TSP) concentrations are well-below Federal and Montana ambient air quality standards (AAQS; see table III-15), and are similar to other undisturbed areas in southeastern Montana (U.S. Department of the Interior and Montana Department of State Lands, 1980). Moreover, although other pollutants were not measured, they, too, are probably very low because no major sources of pollutants exist nearby. On the other hand, ambient air quality standards for TSP were exceeded at the Ashland site, indicating a potential, localized pollution problem.

2. Northern Cheyenne Reservation

TSP concentrations on the Northern Cheyenne Reservation, just west of the Tongue River (fig. III-8), are similarly indicative of good air quality. The

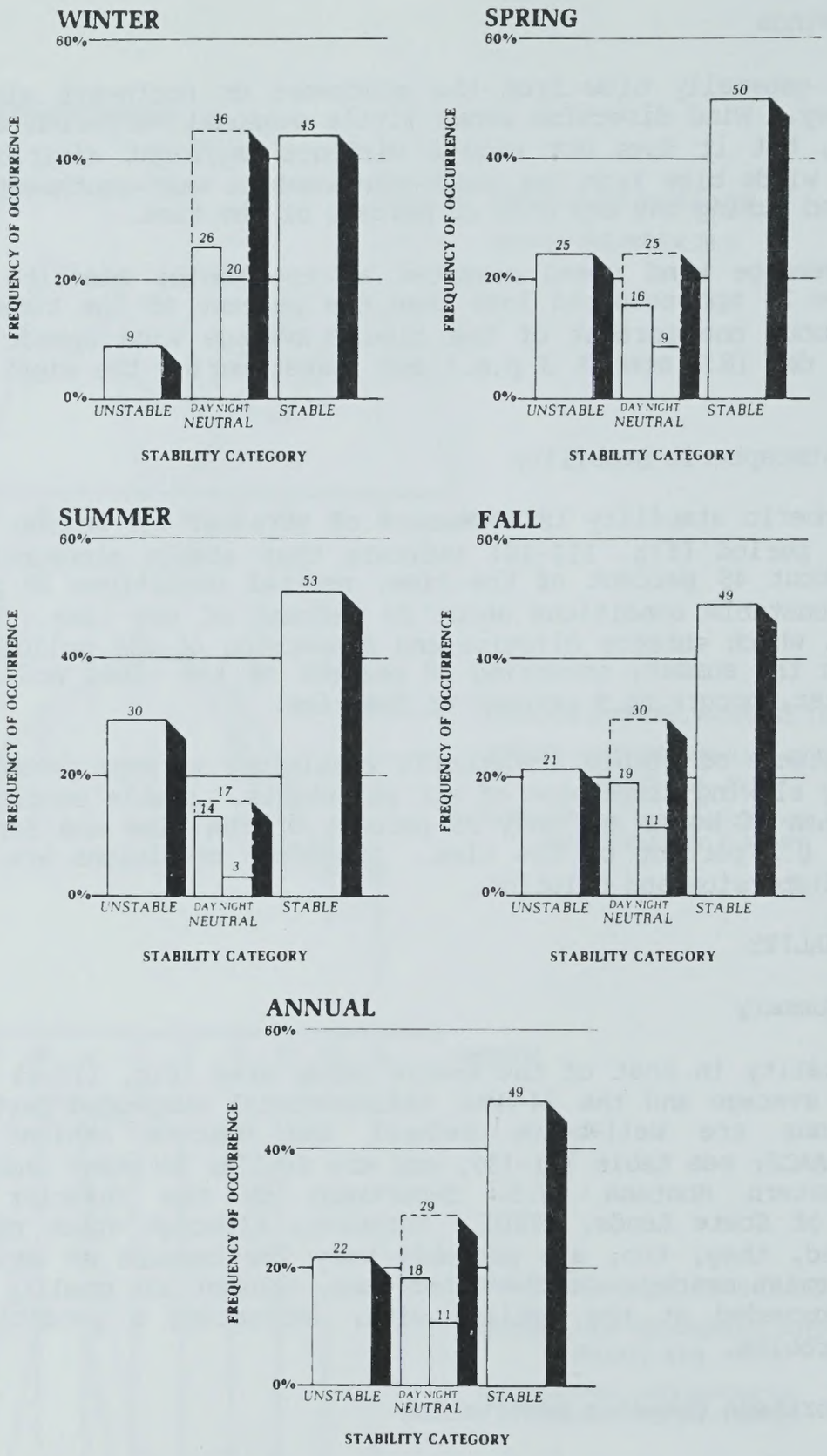

Figure III-10.--Atmospheric stability at various monitoring sites.

Montana Air Quality Bureau monitored TSP concentrations at Fisher Butte, 10 miles northeast of the Montco Met site, elevation 4,396 feet, from January 1978 to December 1979. The bureau found the annual mean TSP concentration to be 16.8 u/m^3, the maximum 24-hour concentration, 143 u/m^3. The lowest concentrations were measured during winter. The Parker Ranch site, located much closer to the proposed permit boundary (fig. III-8), also showed very low TSP concentrations (table III-16).

The Reservation is a Class I air quality area. Accordingly, to prevent significant deterioration of air quality, Federal regulation (40 CFR 52.21) allows little increase in TSP and SO_2 (sulfur dioxide) concentrations. The increases, or "increments," that are allowed are listed in table III-17.

3. Ashland Monitoring Site

Poor air quality in Ashland is indicated by TSP concentrations exceeding the Montana AAQS for both the annual average and 24-hour maximum (table III-18). The single largest contributor to this is probably fugitive dust from traffic on unpaved roads throughout the area. Reentrainment of fugitive dust from U.S. Route 212 also adds to the TSP levels.

The Northern Cheyenne Forest Products sawmill, at the western edge of Ashland, is the only major point source of pollutants in the area. The Montana Air Quality Bureau (MAQB) estimates that the plant annually emits 645 tons of carbon monoxide, 125 tons of particulate, 60 tons of hydrocarbons, 38 tons of nitrogen oxides, and five tons of sulfur dioxide. Nonetheless, this meets MAQB regulations (Harry Keltz, MAQB, written commun., November 4, 1981).

No other source contributes as much pollution to Ashland. Space heating with coal and wood emits similar pollutants to those of the sawmill, but at much lower rates and only during the colder months. Production at Coal Creek Coal Mine, east of Ashland, is too low to affect the air quality.

4. Other Monitoring Sites

The Met and South monitoring sites are located in rural open areas away from any major sources of pollution. Their TSP concentrations reflect the area's pristine air quality (table III-16): the annual average TSP was 24 u/m^3; the maximum 24-hour TSP concentration, 91 u/m^3. The only major particulate emission is traffic on unpaved roads. The lowest TSP concentration occurred at all sites from November through March (fig. III-11), when snow cover and frozen surfaces probably reduced emissions.

The area surrounding the proposed permit area and the Northern Cheyenne Indian Reservation is a Class II air quality area. Federal regulations allow a greater increase in TSP and SO_2 concentrations here than in a Class I area (table III-17). Still Ambient Air Quality Standards (table III-15) cannot, by law, be exceeded.

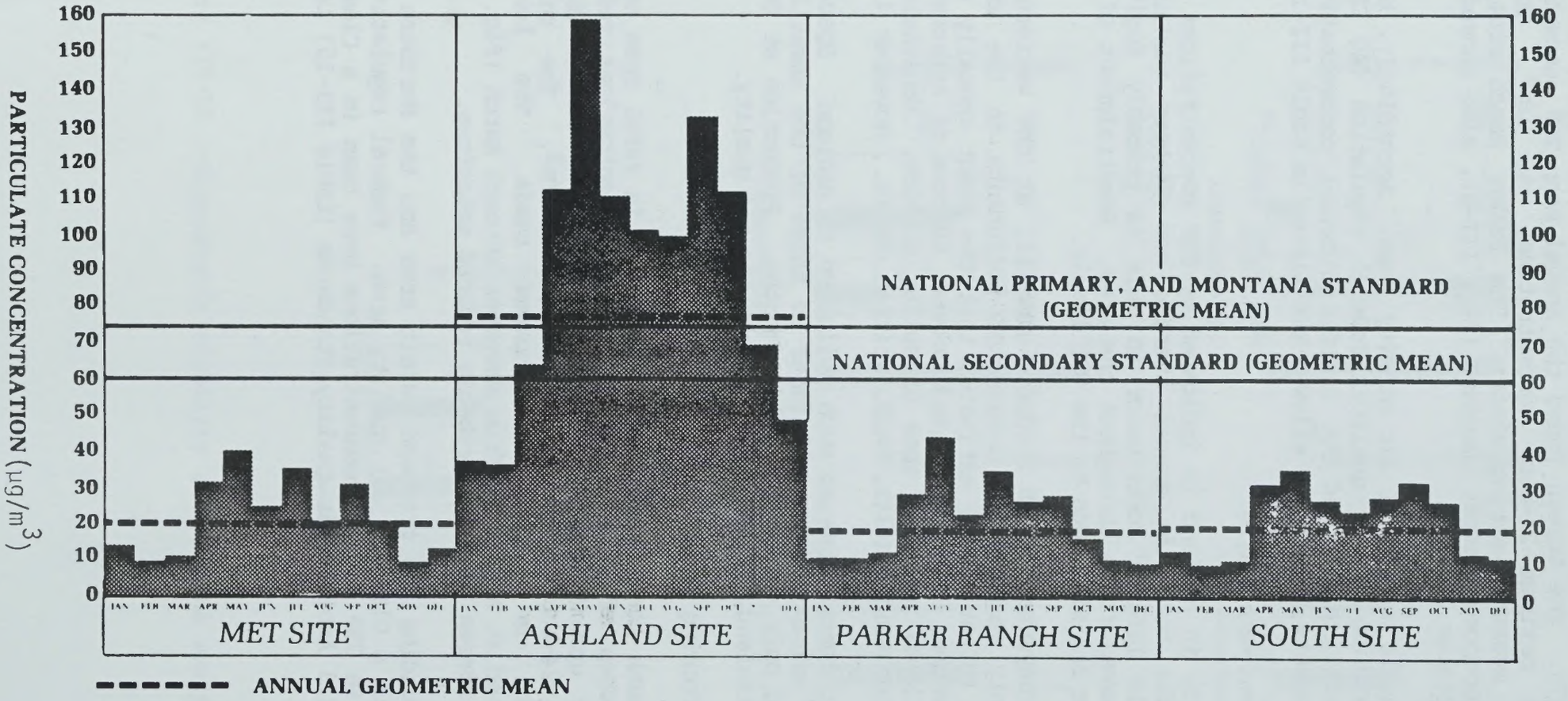

Figure III-11.--Monthlog arithmetic and annual geometric means of total suspended particulates, August 1979 - July 1980.

Table III-15.--Ambient air quality standards (AAQS)

Pollutant	Averaging time	Montana	Federal primary[a]	Federal secondary[a]
Total suspended particulate	Annual	75ug/m3[b]	75ug/m3[c]	60ug/m3[c]
	24 hours	200ug/m3[d]	260ug/m3	150ug/m3[c]
Sulfur dixoide	1 hour	0.50ppm[e]	---[h]	---
	3 hours	---	---	0.5ppm
	24 hours	0.10ppm[d]	0.14ppm	---
	Annual	0.02ppm[f]	0.03ppm[f]	---
Carbon monoxide	1 hour	23ppm[f]	35ppm	35ppm
	8 hours	9ppm[f]	9ppm	9ppm
Lead	90 days	1.5ug/m3	1.5ug/m3	1.5ug/m3
Nitrogen dioxide	1 hour	0.30ppm[d]		
	Annual	0.05ppm[f]	0.05ppm[f]	0.05ppm[f]
Settled particulate	30 days	10g/m2[f]	---	---
Nonmethane hydrocarbons[g]	3 hours (6-9 a.m.)	---	0.24ppm	0.24ppm
Photochemical oxidants (ozone)	1 hour	0.10ppm[d]	0.12ppm	0.12ppm

[a]Federal ambient air quality standards with averaging time less than 1 year are not to be exceeded more than once per year.
[b]Arithmetic average; not exceeded.
[c]Geometric mean; not to be exceeded.
[d]Not to be exceeded more than once per year.
[e]Not to be exceeded more than 18 times in any 12 consecutive months.
[f]Not to be exceeded.
[g]Set as a guide to achieve photochemical oxidant standards.
[h]---indicates no standard.

Table III-16.--Total suspended particulate concentrations in micrograms per cubic meter, from August 1979 through July 1980 in the Montco study area

Site	Number of samples	Arithmetic mean	Geometric mean	Max.[2] 1st	Max. 2d	Max. 3d
Met	71	24.5	19.9	70.0	57.6	55.8
South	66	23.3	19.0	91.3	57.4	43.7
Parker Ranch	70	22.0	17.6	67.1	64.3	53.0
Ashland	69	95.0	76.4	238.5	215.4	198.0
Fisher Butte[1]	66	16.8	9.9	143.0	56.0	47.0

[1] Monitoring period was January 1978 to December 1979.
[2] Max. 1st means the highest 24-hour concentration measured.
Max. 2d means the second highest 24-hour concentration measured.
Max. 3d means the third highest 24-hour concentration measured.

Table III-17.--PSD concentrations increments[1]

Pollutants	Increment (ug/m^3)
Class I areas	
Particulate matter	
Annual geometric mean	5
24-hour maximum	10
Sulfur dioxide	
Annual arithmetic mean	2
24-hour maximum	5
3-hour maximum	25
Class II areas	
Particulate matter	
Annual geometric mean	19
24-hour maximum	37
Sulfur dioxide	
Annual arithmetic mean	20
24-hour maximum	91
3-hour maximum	512
Class III areas	
Particulate matter	
Annual geometric mean	37
24-hour maximum	75
Sulfur dioxide	
Annual arithmetic mean	40
24-hour maximum	182
3-hour maximum	700

[1]For any period other than the annual, the applicable maximum allowable increase may be exceeded during one such period per year at any one location.

Concentrations of arsenic, lead, cadmium, and other trace elements in rural areas such as the study area are extremely low (U.S. Environmental Protection Agency, 1976; Gelhaus, 1976).

5. Visibility

Annual average visibility in the study area is about 100 miles, with seasonal averages ranging from 81 miles in spring to 109 miles in summer.

I. ECONOMIC CONDITIONS

1. Summary

The Montco mine would affect economic conditions primarily in Rosebud, Powder River, and Custer Counties, which form the study region for this section. Rosebud County's economy is based on energy development, construction, and agriculture; Powder River County's economy, on agriculture and oil; and Custer County's economy, on the agricultural trade center of Miles City. Coal mining and electric power generation are becoming increasingly important in the region, especially in Rosebud County. Energy development in Rosebud County contributes substantial revenues to State and Federal governments; in turn, State and Federal impact assistance has returned considerable fiscal support to Rosebud County.

Unless otherwise noted, employment and income projections in this section were made by the Montana Department of State Lands in their draft environmental impact statement on the Montco mine (MDSL, 1982d), based on a report by Mountain West Research, Inc. (MWRI, 1981). The model they used is explained briefly in appendix 6 of that EIS. These projections have been independently reviewed and adopted by OSM in preparing this EIS.

2. Region

The major communities in the study region include Miles City, the Custer County seat and a trade and government center for a wide area in eastern Montana; Forsyth, the Rosebud County seat; Colstrip, a company-owned town where the region's most intensive energy development is located; and Broadus, the Powder River County seat. The greater portion of the Northern Cheyenne Indian Reservation is also located in the study region. The nearest community to the proposed Montco mine is the small, unincorporated town of Ashland in Rosebud County.

Although regional employment decreased slightly between 1950 and 1970, it grew 51 percent by 1980, to 11,994 workers. The increase was led by mining and construction employment in Rosebud County. The region's unemployment rate has been consistently below that for Montana.

Between 1950 and 1980, agricultural employment decreased 38 percent, mostly during the 1950's. Mining employment increased twelve-fold in the 1970's. Construction employment declined from 1950 to 1970, but then added more than any other sector to regional employment in the 1970's with the construction of the first two units of the Colstrip generating station. Manufacturing employment grew 60 percent between 1950 and 1970, but then declined slightly during the 1970's. Employment in the transportation and

utilities (TU) industrial sector fell 57 percent between 1950 and 1970, but then grew 44 percent by 1980, due largely to utilities employment at Colstrip. Tertiary sector employment, including finance, insurance, and real estate (FIRE), trade, services, and nonfarm proprietors, steadily increased during the entire period. Government employment grew 45 percent between 1950 and 1970 and 244 percent between 1970 and 1980.

Adjusted for inflation, per capita income grew at an annual rate of 2.1 percent during the 1970's. (See MDSL, 1982d, table II-20.) As a part of total personal income, earned income decreased from 78 percent of total in 1970 to 75 percent in 1979; dividends, interest, and rent increased from 16 percent to 19 percent; and transfer payments also increased slightly.

3. Rosebud County

Since 1970, energy development has changed the fundamental structure of Rosebud County's economy. Rosebud County is the site of Western Energy's Rosebud Mine, Colstrip generating units 1 and 2, Peabody's Big Sky Mine, and coal-related railroad employment in Forsyth. As a result, mining employment during the 1970's grew from 43 to 473 workers and TU employment from 151 to 480 workers. The construction of Colstrip units 3 and 4 began in earnest in 1980 and brought employment there to 1,121. Over the decade the share of mining and TU employment rose from 9 percent of the total work force to 14.5 percent.

This energy development spurred the remainder of Rosebud County's economy: government employment increased 58 percent between 1970 and 1979; the share of employment held by the trade, FIRE, and service employment increased 40 percent, from 25 to 35 percent of the total. (See table III-18.) Moreover, non-energy-related construction, trade, FIRE, services, nonfarm proprietors, and government sectors rose from 55 percent of all workers in 1970 to 67 percent in 1979.

Over the same period, agricultural employment steadily declined, as it has for more than four decades. The decline between 1950 and 1970 was offset by increases in manufacturing (mainly sawmills) and services (mainly associated with the Northern Cheyenne Indian Reservation). Total employment thus remained about the same. The unemployment rate was slightly above 3 percent between 1970 and 1975; since then it has remained above 5 percent (MDSL, 1982d, table II-22).

As the employment pattern has changed in Rosebud County, so has the composition of total personal income. Labor and proprietor's income, the largest component of personal income in 1970, grew faster than, and thus increased its relative position to, other elements: lead by increases in wages and salaries in the mining and TU industries, it nearly tripled between 1970 and 1979, from $13.2 to $51.8 million. Likewise, since personal income grew faster than population, per capita income in constant dollars also jumped, from $2,992 in 1970 to $3,905 in 1979.

Table III-18.--Employment by broad industry in Rosebud County, 1970-79
[Source: U.S. Department of Commerce, 1981]

	1970[1]	1971[1]	1972[1]	1973[1]	1974[1]	1975[2]	1976[2]	1977[2]	1978[2]	1979[2]
Agriculture[3]	704	710	696	681	692	658	649	596	577	617
Mining	43	79	104	269	283	392	416	403	426	393
Construction	29	25	39	76	180	1,354	656	345	267	282
Manufacturing	214	230	265	192	180	160	146	52	81	222
T.U.[4]	184	181	192	193	212	210	226	241	239	253
Trade	216	242	269	312	346	411	425	367	400	432
F.I.R.E.[5]	19	26	37	43	49	50	61	61	59	65
Services	391	520	569	727	827	809	905	1,002	1,108	1,051
Nonfarm proprietors	228	233	215	233	275	338	344	367	366	369
Federal Government	159	162	173	174	204	226	205	201	209	216
State and local government	330	353	367	393	419	441	455	480	530	557
Total	2,517	2,761	2,926	3,293	3,667	5,049	4,488	4,115	4,262	4,457

[1]Estimates based on 1967 S.I.C. codes.
[2]Estimates based on 1972 S.I.C. codes.
[3]Includes farm proprietors, farm wage and salary employment, agricultural services, forestry, fisheries, and other.
[4]Transportation and public utilities.
[5]Finance, insurance, and real estate.

Forsyth is the county's major retail trade center. In the southern part of the county Colstrip, Lame Deer, and Ashland are minor trade centers. Billings, Hardin, and Sheridan, Wyoming draw trade in higher priced items such as household appliances and funiture.

4. Powder River County

Since 1950, agricultural employment in Powder River County has declined by 308 jobs, dropping from 71 to 42 percent of total employment. As a result, total employment fell in the 1950's. In contrast, total employment grew rapidly during the 1960's and modestly during the 1970's, spurred by the development of the Belle Creek oil field in southeastern Powder River County.

During the 1970's, government employment grew to 264 workers. Mining, construction, and TU, all related to initial oil field development, declined. Service sector employment, including trade, FIRE, services, and nonfarm proprietors, grew slowly--these plus government accounted for 30 percent of total employment in 1970 and 49 percent in 1980.

These developments have concentrated the county's employment in Broadus, the county seat and trade center. Miles City, Belle Fourche and Rapid City, South Dakota, and Gillette, Wyoming also draw trade from the county.

Total personal income in constant dollars grew an average 1.9 percent between 1970 and 1979 (MDSL, 1982, table II-23.) Because of population decline, per capita income grew even faster, an average of 3.4 percent, rising from $3,232 in 1970 to $4,385 in 1979. Of total income, labor and proprietor's income fell from 81 percent in 1970 to 65 percent in 1979. Therefore, most income growth was generated by transfer payments dividends, interest, and rent (which includes royalties from oil production).

5. Custer County

Long-term county employment trends show a decline in agriculture, mining, construction, and TU employment; relatively stable manufacturing employment; and growing service sector or tertiary employment. The proportion of jobs in agriculture, mining, construction, manufacturing, and TU declined from nearly half to less than a quarter of total employment from 1950 to 1980. Government employment grew from 5 percent of the total in 1950 to 22 percent in 1980. Total employment grew by 18 percent from 1950 to 1980, an annual rate of 0.6 percent. The greatest growth in employment in the 1970's was in services, trade, nonfarm proprietors, and construction, with combined increases of nearly 1,400 jobs. In contrast, mining employment declined by 68 jobs, farm proprietors by 63, and farm wage and salary workers by 18.

In real terms, Custer County's per capita income grew 2.7 percent annually during the 1970's, growing most in the first half of the decade. The more important causes of growth in total income were dividends, interest, and rent (increasing 7.7 percent annually) and transfer payments (increasing 6.7 percent annually). In contrast, labor and proprietor's income fell from 77 percent of the total in 1970 to 71 percent in 1979.

Miles City, the county seat, is the center for trade, government, education, and health services serving a large area of eastern Montana. Its economic future is largely dependent on the agricultural economy. Recently, Glendive has become a more important competitor as a trade center, and Billings has started to become a competitor as a wholesaling center. Coal development in Rosebud County and scattered oil exploration in Miles City's trade area will replace these trade losses.

6. Northern Cheyenne Reservation

The reservation economy is based on jobs provided by the tribal government and Federal programs (Northern Cheyenne Planning Office [NCPO], July 1981, p.2). There has been a slow shift from a subsistence to a cash economy, but most households still rely on hunting and gathering to supplement their incomes (NCPO, August 1981, p. 91). As at most reservations in Montana, chronic unemployment is a serious problem; 57 percent of the 27 respondents to a recent survey in the Birney District of the Reservation were unemployed (NCPO, August 1981, p.11); few had technical or specialized job training; and only five were actively seeking employment. Half of the district's households live on less than $5,000 per year; 57 percent supplement their incomes by hunting, gathering, fishing, and gardening.

Unemployment in the Ashland District of the Reservation was 31 percent--less than in the Birney District, but still a serious problem (NCPO, August 1981, p. 113-114). The average household income is about $10,000, but 43 percent of the households earn less than $5,000 per year and 84 percent supplement their income by traditional hunting and gathering activities.

7. Fiscal Conditions

Property taxes are the most important source of local government and school district revenues in Rosebud, Powder River, and Custer Counties (Mountain West Research Inc. [MWRI], Nov. 1981). State and Federal impact assistance have added substantial amounts to this in recent years.

Over the last four years, property taxes have provided an average of 40 percent of Rosebud County's revenues, 71 percent of Powder River County's revenues, and 33 percent of Custer County's revenues (MWRI, Nov. 1981). In school districts with taxable value from coal or oil development, most general fund revenues have come from property taxes paid in that district alone. In other school districts, such as Ashland Elementary, Broadus Elementary, and both high school and elementary in Forsyth, most general fund revenues have come from the County Equalization Levy (MWRI, Nov. 1981).

In 1980, energy development made up more than 60 percent of the taxable value in Rosebud County and almost 80 percent in Powder River County (Montana Department of Revenue, 1980). The Colstrip generating units and mining machinery were the next largest components in Rosebud County. (Montana Department of Revenue, 1980). In contrast, residential and commercial property in Miles City and agricultural property made up most of the tax base in Custer County (Montana Department of Revenue, 1980).

As oil production in Powder River County declines over the remainder of the century, the county will lose the bulk of its taxable value (MWRI, Nov. 1981). At the current mill levy, the eroding tax base will produce insufficient revenues to fund the current level of county services beginning in 1992 (MWRI, Nov. 1981). In constrast, increased coal production at the Western Energy mine and completion of Colstrip units 3 and 4 will increase Rosebud County's taxable value by about 22 percent over the next four years (MWRI, Nov. 1981, Appendix D-3).

The large amounts of taxable value provided by energy development have kept tax rates low in Rosebud and Powder River Counties. For comparison, Big Horn County, Montana's other major coal mining area, had a total mill levy for state, county, and school purposes in 1980-81 of 93.69 mills. That made it the only county with a mill levy lower than Rosebud's 100.82 mills and Powder River's 101.42 mills (Montana Department of Revenue, 1980, p. 111). Statewide, the average was 198.16 mills.

One exception to these low tax rates is the Ashland elementary school district, 32J, which is the district nearest the proposed minesite. The 1980-81 tax rate here was 126.94 mills in the Rosebud County portion and 141.29 mills in the Powder River County portion (Montana Tax Foundation, 1981, pp. 50 and 58).

J. SOCIAL CONDITIONS

1. Summary

The Montco mine would affect population in Rosebud, Powder River, and Custer Counties. Over the next three decades, Rosebud County will grow the most if no new mines are built; Powder River County will lose population; and Custer County's population will increase slightly.

The mine would affect social organization primarily in the Ashland-Birney area. The Ashland and Birney communities are closely tied to the larger society economically, and to a lesser degree politically and socially. There is substantial inequality in the economic resources and social esteem given to individual Ashland residents; this stratification is less apparent in Birney. The Ashland community is differentiated into numerous small social groups that exhibit little community-level coordination. The Birney community, on the other hand, is more homogeneous. In both communities most people feel they have a voice in decisions regarding their communities. The Ashland community is not well integrated; Birney, however, appears to be. Family life is important in both communities and among the Northern Cheyenne.

The Northern Cheyenne are a culturally distinct population located near the proposed mine. Despite the proximity of Northern Cheyenne settlements to Ashland and Birney, the Northern Cheyenne form separate communities.

The ensuing documentation of these conclusions is drawn from data and analyses in previous EIS's on the study region (MDSL, 1982d; U.S. Department of the Interior and Montana Department of State Lands, 1980).

2. Existing Energy Development

Rosebud, Powder River, and Custer Counties differ in their experience with energy development and the population influx it brings. Rosebud County has experienced the greatest influx of newcomers as a result of construction at Colstrip. Western Energy Company resumed production at the Rosebud Mine in 1968 and has expanded production since. Peabody Coal Company began mining coal in Rosebud County in 1969. Colstrip generating units 1 and 2 were built between 1972 and 1976; units 3 and 4 are currently under construction. Forsyth, the only incorporated town in the county, experienced increased population as a spillover effect from these activities.

Ashland and Birney have had limited experience with energy development. Seventy-nine percent of local residents surveyed (MDSL, 1982e) stated they knew little about coal mining; only 7 percent of those surveyed had worked in a coal mine in the region. Ashland's population fluctuates somewhat as a result of work force changes at the local sawmill. The only other energy development in the Ashland-Birney area is the small Coal Creek mine (now closed), which employs up to 20 people. Many members of these communities, however, have become knowledgeable about mining and some of its potential consequences through their observation of mining in nearby areas. The Birney community split over the coal development issue about 10 years ago, according to informants interviewed; some feel the tension is lessening (MDSL, 1982c).

3. Demography

a. Study Region

The population of rural areas in the three-county study region has declined slowly since 1950, owing mostly to declining agricultural employment. Population increases in urban areas, primarily from renewed coal development in Rosebud County, reversed this trend in the 1970's. Rosebud County's population grew 87 percent from 1970 to 1980--from 6,032 to 11,278. Custer County grew about 9 percent during the same period--from 12,174 to 13,109--owing largely to the increasing importance of Miles City as a regional trade center, and the oil and gas boom in the Williston Basin. Powder River County's population has fluctuated in response to changing agricultural and oil and gas employment, showing a net loss of 14 percent from 1970 to 1980--from 2,862 to 2,520.

Population density in the study region is low, ranging from 0.8 persons per square mile in Powder River County to 3.5 persons per square mile in Custer County. (Custer County includes Miles City, the largest town in the study region.) The Northern Cheyenne Reservation had a 1980 population density of about 5 people per square mile.

The following population projections for Rosebud, Powder River and Custer Counties in the absence of new energy development were made by Mountain West Research Inc. (MWRI, 1981). Those projections are displayed as the "baseline" population in figs. IV-6 through IV-9.

b. Rosebud County

Rosebud County's population will drop from about 16,700 in 1983 to 11,600 in 1986, as construction of Colstrip units 3 and 4 is completed. Between 1986 and 2010, the county will grow 5 percent, to 12,200. Although about 1,000 people will leave the county to seek employment elsewhere, an excess of births over deaths will result in a net population increase.

The population of the Ashland area will increase from 431 in 1980 to 530 by 1985, reflecting Colstrip construction activity and anticipated expansion of the wood products industry. After 1985, the population will slowly decline to 460 by 2010, 6 percent above the 1980 figure.

The population of the Birney area will gradually decrease from 136 in 1980 to 117 by 2010 as a result of a decreasing number of agricultural jobs.

Colstrip's population is anticipated to decline to 3,900 by 1986--one-half of its 1982 construction peak. Population will then remain relatively stable, gaining 3 percent from 1986 to 2010.

The population of Forsyth will fall from its current 3,500 to 2,900 by 1986 as the Colstrip generating units are completed. From 1986 to 2010, its population will fluctuate slightly within the 2,800-2,900 range.

The population of the Northern Cheyenne Reservation will expand about 1 percent annually due to natural increase, resulting in a 2010 population of 3,700--40 percent larger than in 1980.

c. Powder River County

Powder River County's population is projected to drop about 1 percent per year for the next three decades--from its current 2,500 to about 1,800, mostly from employment-related migration.

Broadus, the trade center for Powder River County, had a 1980 population of 712 persons. The population will increase slightly during the 1980's, owing to growth caused by oil exploration in the county. However, the town's population will begin to decline in the 1990's as oil exploration and production begin to decline. The population will fall from 700 persons in 1988 to 600 persons by 2010.

d. Custer County

Custer County's population will increase gradually--about 0.4 percent per year--until 1988, mostly from natural increase. Employment-related migration out of the county will become substantial in 1989 and continue until 2004, because jobs are forecast to not increase fast enough to accommodate the growing labor force. By 2005, the population will be 6 percent less than in 1980. After 2004 the population will grow slowly, reaching 12,500 in 2010.

Miles City and the surrounding area has a 1980 population of 11,582 persons. The population will grow an average 0.5 percent yearly until 1988, reaching 12,000. After 1988, population will decrease until 2005, when, at 11,000 persons, the figure will be 5 percent less than in 1980.

4. Attitudes of Ashland and Birney Residents

People in the Ashland-Birney area see both advantages and disadvantages to coal mining, according to a Montana Department of State Lands survey (MDSL, 1982e). Thirty-eight percent of the Ashland and Birney residents interviewed favor a coal mine between Ashland and Birney and 40 percent oppose the mine. Only 9 percent favor development of 4 or 5 mines (the cumulative scenario) within a 20-mile radius of Ashland; 62 percent are opposed.

5. Social Organization

This discussion focuses on the communities of Ashland and Birney, where the existing social organization would be most affected by the Montco mine. It is based on surveys and other research by the Montana Department of State Lands (MDSL, 1982d).

a. Ashland Area

Residents of Ashland have a broad range of values and interests for an isolated community of 500 people. The town is fragmented into many small social groups whose members seldom interact with one another, except for routine daily activities. Most tasks are done by individuals or small closed groups. There are few community activities and relatively little social integration. Consensus is difficult to obtain because of the structure of the community and the value attached to independence. The public elementary school provides nearly the only focus for community action.

The leadership structure in Ashland is stable; most of the influential people are long-time residents and are mostly business proprietors and ranchers. Most political activity in Ashland is informal; leaders are approached and a solution is generally developed and agreed upon before formal action is taken.

Ashland has established ties with the Montana State government through the Montana Coal Board, which has given grants to the community. The link with the Coal Board is an important asset to the community because it provides access to resources needed to plan for and accommodate growth. However, no community action is being taken to prepare for mine-related development in Ashland, nor is there any outside organization that is making plans for the community. Some individuals are providing housing lots, but no coordination is taking place to provide for other demands expected from growth and no formal group exists to coordinate plans with Montco or with State agencies.

b. Birney Area

People in Birney strongly identify with their community. Leadership is informal and everyone participates when something is needed, according to informants. The only groups in the community, according to residents

interviewed, are those opposing or favoring coal development in the area. The only formal leadership positions are the elementary school board trustees.

People in Birney take pride in being self sufficient, and tend to resist government intervention in their affairs. This isolation from government is breaking down, however, partially as a result of the Bureau of Land Management's coal leasing studies and the State's mining permit process. Birney, like Ashland, has no formal group to plan for possible development, but such planning is less necessary there because less impact from mining is expected.

c. Northern Cheyenne

The Northern Cheyenne's value system is different from that of non-Indians. When asked what is the most important part of the Northern Cheyenne way of life, culture and spirituality was mentioned most frequently (MDSL, 1982e). The Northern Cheyenne revere the land; the strength of their culture and spirituality is based on the natural environment. The Northern Cheyenne supplement their income through hunting, gathering, fishing, and firewood collection. They use the reservation's natural environment for recreation.

The Ashland and Birney districts of the reservation, which are closest to the minesite, are traditional Northern Cheyenne communities. The Cheyenne language is spoken by members in over three-fourths of the households and is the primary language in the majority of households. The Northern Cheyenne feel their culture is disintegrating. Concern was expressed in the NCPO survey that further cultural disintegration may occur as a result of mining.

Little cultural exchange goes on between Indians and non-Indians. Daily interaction between the two groups takes place mostly during commercial activity. The groups have separate cultures and different values. Whites in Ashland generally commented that relations between the Northern Cheyenne and non-Indians are good. Observations and some informant interviews indicate that racial antagonism exists. Although there is little open conflict, there is mutual resentment. The Indian population has not, however, challenged the way the community operates or their position in the community.

K. COMMUNITY SERVICES

1. Summary

This section presents projected needs for housing, facilities, and services in Rosebud, Powder River, and Custer Counties if no new mines are developed. Those facilities and services that would not be affected by the Montco mine (because demand would not increase or surplus capacity already exists) will not be discussed. This section is based on projections made by Mountain West Research, Inc. (MWRI, 1981); the model they used is discussed briefly in MDSL, 1982d, appendix 6.

2. Rosebud County

a. Housing

Demand for housing in Rosebud County is projected to peak at 5,800 units in 1984, due to an expected population influx for construction of Colstrip generating units 3 and 4. Housing demand will drop to 4,500 units in 1986, and then will increase steadily to 5,100 units in 2010.

b. General Government

Current staffing of the general government offices located in Forsyth is projected to meet long-term demand. No long-term demand for additional office space is projected, though periodic work loads will create crowded conditions.

c. Law Enforcement

An additional 12 officers will be needed by the Rosebud County Police Department between 1984 and 1986 and another 4 from 1993 to 2010. Existing space and patrol vehicles are projected to be adequate, in spite of a continuing desire for an office/detention facility in the Ashland-Birney area.

d. Hospitals and Health Services

Long-term demand will require an additional 5 physicians , 1 dentist , 14 emergency medical technicians, and 21 hospital beds. County-wide ambulance services will meet the projected long-term demand, but the Ashland-Birney area will continue to be underserved: a serious problem, because the area is far from the closest hospital in Forsyth and is now medically underserved.

Shortages of medical manpower and services in the county will occur between 1984 and 1986 if temporary arrangements are not made. Both temporary and long-term shortages will be worsened should Federal funds be cut that help support medical services for much of southern Rosebud County.

e. Public Health

Five public health nurses will be required to meet current temporary peak demands; the county currently has four. Only three nurses would be needed to meet projected long term demand, however. Additional space will also be needed: 1,200 square feet for temporary peak demand; 600 square feet for the long term. The current area totals 300 square feet.

Staffing and office space for the sanitarian will be adequate for the long term, but a temporary increase of one person and 300 square feet of space may be necessary between 1984 and 1986.

f. Public Works Shop

An additional seven persons will be required by the county shop due to long-term permanent demand. Temporary demand from Colstrip construction will necessitate the addition of five above that level. The existing 20,000-square-foot shop will require an additional 4,500 square feet to meet long-term demand and 8,000 square feet to meet peak temporary demand.

g. Solid Waste Disposal

The present 25-acre solid waste disposal site now in use will be adequate for about 20 more years. After then, 3 acres will have to be added annually.

h. Library

The existing county library staff, number of volumes, and building space will be adequate to meet long-term demand. The Sagebrush Federation of Libraries' bookmobile, which serves Colstrip and Ashland, will supplement services provided at Forsyth. A small, temporary increase in staff, space, and volumes will be necessary between the construction years of 1984 and 1986.

i. Social Welfare

Caseloads for Rosebud County social workers exceed State standards (Montana Department of State Lands, written commun., January 12, 1984). A grant from the Montana Coal Board to the Rosebud County Department of Public Welfare in 1983 should allow for the needed professional and support personnel.

3. Ashland-Birney Area

a. Housing

Demand for housing units in Ashland will rise from 179 in 1980 to 209 in 1984. Demand will drop slightly the next year and fluctuate between 194 and 206 until 2010. The 206 units, needed during 2005, represent a 15 percent increase over 1980.

Housing demand in the Birney area will rise from 50 units in 1980 to 55 by 1985. Demand is then expected to drop to 46 in 1998 and increase to 50 by 2010.

b. Safety

Because Ashland and Birney are unincorporated communities, general government and public safety services are provided by Rosebud County. Nonetheless, the area does have a public safety problem, because of the lack of organized fire protection services in the Birney community.

c. Public Works

The present water supply system in Ashland is adequate to meet both temporary and long-term demand, but storage capacity is not. A 19 percent increase, from 200,000 to 237,000 gallons, will be required for long-term permanent demand. Another 26,000 gallons will be needed to meet temporary demand in 1986. Birney residents use individual wells for their water supply.

d. Education

The Ashland elementary school currently has 11 teachers; the demand for teachers will decline and fluctuate between seven and eight teachers until 2001, when demand will drop to six and remain there through 2010. The elementary school at Birney has one teacher, which will be adequate through 2010.

At present there is no high school in either Ashland or Birney. It is assumed for the purposes of this study that a facility will be built in Ashland. A 24-acre site will be needed. Three high school teachers will also be needed through 2010. Space requirements will fluctuate between 500 and 700 square feet through 2010.

4. Colstrip

a. Housing

The demand for housing units in Colstrip will increase from 1,050 in 1980 to 2,356 in 1983. After construction of Units 3 and 4, demand is expected to decrease to 1,115 in 1986, then increase gradually to 1,291 in 2010, a 23 percent increase over 1980. The demand for multi-family housing is expected to rise from 28 percent of total demand in 1980 to 36 percent in 2010.

b. Fire Protection

Additional fire protection will be needed temporarily. The volunteer force will need 32 more volunteers, 1,000 square feet of space, and one more vehicle.

c. Education

Between 1982 and 1986, 11,000 square feet of additional classroom space will be temporarily needed. As construction workers and their families leave and the remaining school-age children progress through the upper grades, long-term space requirements are projected to drop to half of the current capacity. Temporary classrooms may be warranted.

5. Forsyth

a. Housing

Housing demand in the Forsyth area will increase to 1,392 units in 1983, then fluctuate in the 1,200 to 1,300 range through 2010. The demand for 1,290 units in 2010 is a 4 percent increase over the 1980 level. Demand for multi-family housing is forecast to increase from 15 percent of total demand in 1980 to 23 percent in 2010.

b. General Government

City government staff now requires two additional staff to meet minimum standards; this would increase the total from seven to nine.

c. Public Safety

The city's fire protection service will require an increase from 16 to 30 persons to meet long-term demand. Fire protection in Forsyth is operated by volunteers. Space and vehicles for the department will remain adequate at the existing level through the next three decades.

d. Public Works

The current water supply and water treatment system for Forsyth will meet the population's needs for the next three decades. Water storage capacity, however, will need to be temporarily increased until about 1986.

6. Powder River County

a. Housing

Housing demand is expected to decline gradually from the 1980 level of 1,080 units to 990 units in 2001, then rise slightly to 1,005 units by 2010, 9 percent below the 1980 level.

b. Public Safety

One additional sworn officer will be needed in the Powder River County Police Department until 1986. This would increase the force to five. The need for the additional officer would end after 1986, as the population decreases with the slowdown of oil production.

c. Health and Welfare

One additional physician and seven hospital beds are needed to meet the demand for the next three decades. The county is currently served by one general practitioner and does not have a hospital; emergency transfer service to hospitals in either Forsyth, Miles City, or Sheridan need improvement.

7. Ashland Vicinity of Powder River County

Housing demand will increase 34 percent, from 97 units in 1980 to 130 units in 2010.

8. Broadus

Housing demand in Broadus is expected to fluctuate between 335 and 355 units during the next 3 decades.

The existing water supply for Broadus is well above the projected need. Water storage is also adequate.

The existing solid waste disposal site will be adequate for approximately 10 more years, but long-term needs will require an additional acre per year after 1991.

9. Custer County

Housing in Custer County is forecast to decline slowly from 5,477 units in 1980 to 5,249 by 1999. Demand is then expected to increase by about 50 units a year to 5,743 by 2010. This would be a 5 percent increase over 1980. Demand is expected to rise for multi-family housing while declining for single-family units and mobile homes. This shift follows a national trend from single- to multi-family units.

10. Miles City

Housing demand in Miles City is forecast to decline slowly from 1980 to 1999, then increase somewhat by 2010. This change would result in a net 5 percent increase from 1980 to 2010.

L. LAND USE

1. Life-of-Mine Area

The pattern of land uses of the entire life-of-mine area is similar to that of Rosebud County and the region. Three ranching operations lie within the life-of-mine area, each similar to other cow/calf operations along perennial streams in southern Rosebud County. Cattle are fed during the winter with hay grown in irrigated fields along the Tongue River. They graze on native range during the rest of the year. Ranches in the area use Forest Service grazing allotments from May through November.

The area provides wildlife habitat as a secondary use (D'Appolonia Consulting Engineers, Inc., September 1980, p. J-10). The habitat supports mule deer, white-tailed deer, pronghorn antelope, and a variety of other species. (See Wildlife.)

2. Permit Area

The North King mining unit and the facilities area, like the region, are dominated by livestock grazing. (See table III-19.) The proposed permit area does, however, contain a higher percentage of irrigated hayland, dryland crop area, and farmstead acreage than the remainder of the mine plan area. About 17 acres of the irrigated hayland are classified as prime farmland by the Soil and Conservation Service. (See Soils.)

The condition of the grazing land in the permit area is about one-half of its maximum potential productivity of 0.26 cow-calf units per acre. (See Vegetation.) This condition is typical of the region. The area's irrigated haylands usually produce 3 to 4 tons of hay per acre annually, which is fed to the current owner/operator's cattle throughout the winter (D'Appolonia Consulting Engineers, Inc., September 1980, p. J-12).

Table III-19.--Premining land use in Montco life-of-mine area

[Source: Lanny Icenogle, Montco, written commun., January 12, 1984. Data are acres]

Land use type	North King mining unit	Facilities area	Associated	Total life-of-mine area
Irrigated Hay	0	2	1	150
Dryland Crop	0	7	7	14
Rangeland	405	136	595	8,962
Pine/Juniper	95	19	0	1,002
Farmsteads	0	1	0	26
Impoundments	2	0	0	8
County Road	0	5	0	9
Subtotal	502	169	603	10,201

M. TRANSPORTATION

1. Summary

Owing to sparse population and widely separated towns in Rosebud, Powder River, and Custer Counties, most people, consumer goods, and agricultural products move by roadways. The road network is not extensive but is generally adequate for the existing population. (See fig. III-12.) Rail service is provided by the Burlington Northern Railroad (BN). Commercial passenger service is provided by bus on the interstate highways and by air carriers at Billings and Miles City.

2. Highways

Interstate 94, the region's main east-west artery, follows the Yellowstone Valley. U.S. Highway 212 (Federal Aid Primary [FAP] 37) is the major highway serving the southeastern corner of Montana and is the nearest east-west connection to the proposed minesite. Federal Aid Secondary (FAS) Route 566, the main road to the proposed mine area, leaves Ashland and travels southwest about 7 miles to the Montco mine area, then continues through Birney and intersects the Decker Road (FAS 314) north of Decker.

A loose network of county and Bureau of Indian Affairs roads provides ranchers and rural residents access to the primary and secondary road system. These are mostly gravel surfaced, with curves and grades conforming closely to the existing terrain.

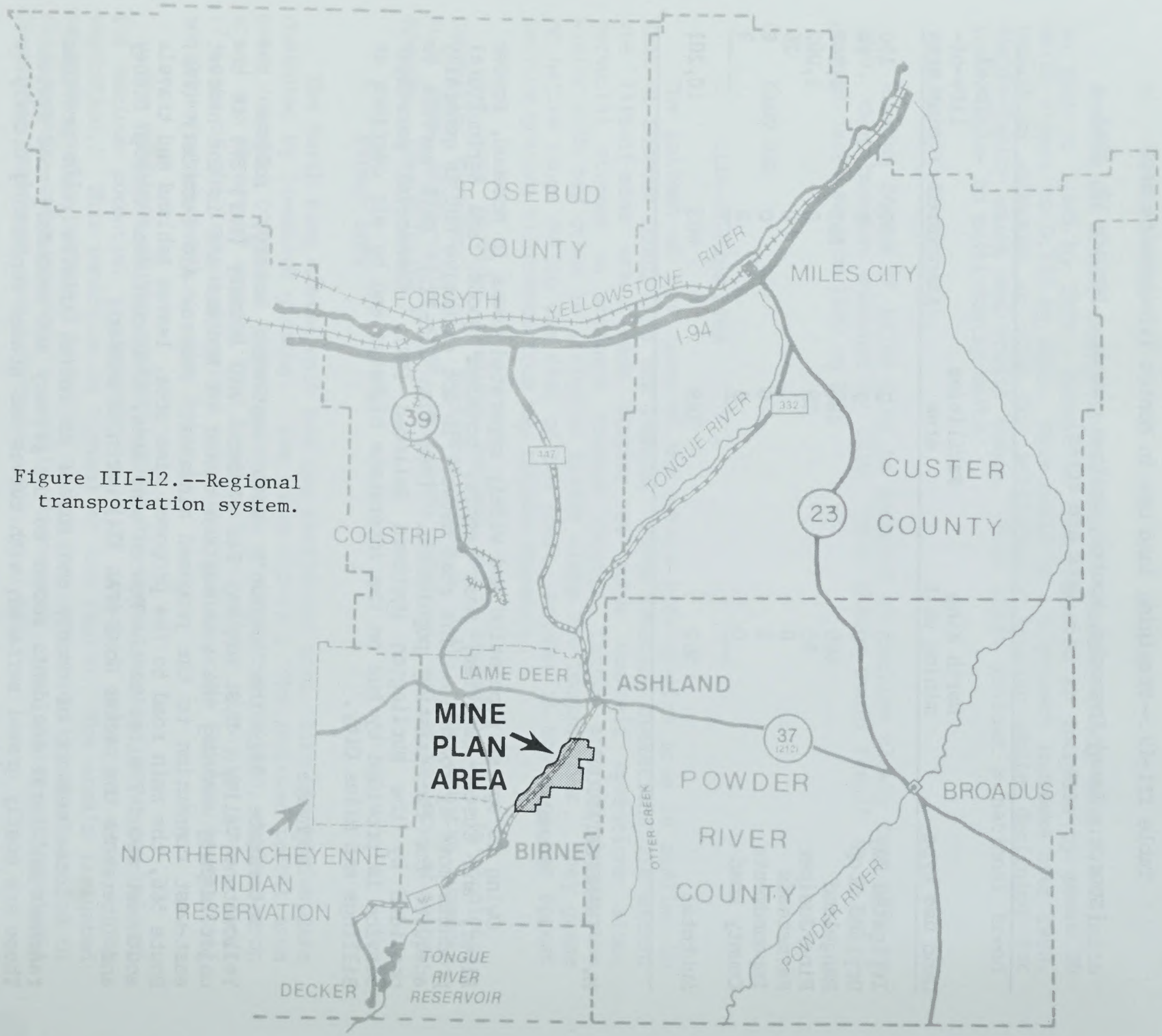

Figure III-12.--Regional transportation system.

Traffic on roads near the proposed minesite in 1980 did not approach 1,000 vehicles/lane/hour, the theoretical capacity for standard two-lane or multi-lane roads (see table III-20). Effective capacities on individual road segments are less, however, owing to surface conditions, narrow shoulders, curves and grades, rail and road cross traffic, and the mixing of slow with faster-moving vehicles. Traffic volumes have increased substantially in recent years, particularly on FAP 39, due to coal development and the construction of Colstrip generating units 3 and 4.

Accident rates are about the same as the average State rate for primary system highways. (See table III-21.) Between 1976 and 1980 there were 479 traffic accidents in which 32 persons were killed and 254 were injured.

3. Railroads

There is no rail service in Powder River County. Rosebud County and Custer County are served by Burlington Northern (BN). Principal inbound commodities are fertilizers, building materials, and machinery; principal outbound commodities are coal, grain, and other agricultural products (Mountain West Research, Inc. [MWRI], Nov., 1981, p. 3-27). During 1981, 16 trains per day--10 coal and 6 general merchandise--passed through Miles City on the BN mainline (Interstate Commerce Commission, 1983, p. A3-A14).

N. RECREATION

1. Summary.

Recreation resources in the Ashland-Birney area include natural resources, such as the Tongue River and the Custer National Forest, developed recreational facilities on the forest, recreation sites on the Northern Cheyenne Indian Reservation and developed facilities in Colstrip and Ashland. People in the area prefer outdoor activities.

The Montana Department of Fish, Wildlife and Parks manages three State recreation areas in Rosebud County, which provide opportunities for fishing and float trips.

The Custer National Forest has four developed recreation sites in the Ashland-Birney area, which are used for picnicking, camping, fishing, and hunting (Montana Department of Fish, Wildlife, & Parks, October 1981, p. 18 and 21). There are no trails in the National Forest, but much of it is accessible from roads (Montana Department of Fish, Wildlife, and Parks, 1978, p. 153). About 90 percent of the access is controlled by ranchers. The forest receives a large amount of forest use, primarily by locals for hunting. The area is also heavily used by Colstrip residents and to a lesser extent by out-of-state residents, who contribute 20 percent of the overall forest use.

Within the forest, the 16,000-acre Tongue River Breaks roadless area offers opportunities for solitude and is used primarily for hunting. Congressional legislation in 1983 ended this area's former administrative classification as a wilderness study area; however, the area currently remains undeveloped. The area receives heavy use from the Northern Cheyenne; during hunting season, use approaches capacity (Chuck Sundt, oral comm., 2/19/82).

Table III-20.--Current and past growth of traffic volumes on various road segments

[Source: Interstate Commerce Commission, 1983, p. A3-38; Montana Department of Highways, written commun., undated]

Road segment	Average daily traffic (ADT) 1980	1971	Percent growth 1971-80
FAP 39			
I-94 to Colstrip	1,200	253	374
Colstrip to Lame Deer	560	203	176
FAP 37			
Lame Deer to Ashland	940	730	29
Ashland to Otter Creek Road (FAS 484)	740	599	24
Otter Creek Road to Broadus	680	500	36
FAS 566			
Ashland to Montco minesite	115	80 (1976)	NA

Table III-21.-- Traffic volumes, accidents, injuries, fatalities and accident rates for selected segments of area highways, 1976-1980

[Source: Montana Department of Highways, Highway Information System, unpublished computer printout]

Road segment	Mean ADT[1] for 1976-80	Total number			Accident rate[2]
		Accidents	Injuries	Fatalities	
FAP 37					
Jct I-90 to Lame Deer	1,116	155	60	13	1.81
Lame Deer to Jct FAS 566	1,027	90	57	6	2.37
Jct FAS 566 to Broadus	612	81	48	2	1.76
FAP 39					
Colstrip to Lame Deer	456	52	35	6	2.75
Jct I-94 to Colstrip	879	101	54	5	2.21

[1] Average daily traffic.

[2] Accident rate = number of accidents per million vehicle miles.

There are a number of developed and undeveloped recreation sites on the Northern Cheyenne Reservation which are used for fishing, boating, swimming, camping, picnicking, and scenic outlooks. Seventy percent of the households surveyed on the reservation actively use the developed recreation areas. Use of the reservation for recreation by nonresidents and nontribal members is primarily for fishing. Use by this group has remained about the same since 1975 (NCPO Survey, 1981). Opportunities for picnicking, fishing, solitude, family activities, swimming, and church gatherings are an important part of the Northern Cheyenne lifestyle (NCPO, December 1981, p. 3). Participating in pow wows and sports is also popular.

Forsyth has three outdoor ice rinks, one golf course, and three picnic areas. Combined, Forsyth and Colstrip own nine tennis courts, eight ball fields, twelve playgrounds, and two outdoor pools. Colstrip also owns three basketball courts. These facilities in Colstrip are dedicated to public use and are managed through the Colstrip Area Recreation and Parks Association, which is largely funded by the operating companies at Colstrip.

Privately owned developed recreation sites include a shooting range a tennis court, basketball court, and handball court and a campground, which is also used for fishing and camping.

Colstrip's recreational facilities and park acreage are currently above the minimum suggested by population-based standards and will be adequate for long-term demand.

The city of Broadus has one-half acre of developed park land. Long-term demand will require this to double.

People in the Ashland-Birney area prefer outdoor activities. In the DSL survey (1981), fishing was the most popular activity mentioned, followed by rodeo, horseback riding, and hunting. Visiting, watching television, picnicking, dancing, and card playing were also mentioned frequently.

The only developed facilities in Ashland are the playground and gym at the elementary school. There is no organized community recreation program. The lack of recreation was mentioned by residents in the Ashland-Birney area as a problem (MDSL, 1982c, 1982e).

O. CULTURAL RESOURCES

1. Summary

Two major cultural resource inventories, one charged with the location, description and evaluation of prehistoric remains (Mineral Research Center, 1979) and the other with the location, description, and evaluation of historic remains (Historical Research Associates, 1980) have been conducted on and around the proposed Montco life-of-mine area. Both surveys were intensive in nature within the mine plan boundaries with a surrounding one-mile buffer zone less intensively inventoried.

Sixty-four cultural resource sites were recorded in the course of the surveys comprised of 16 historic sites and 48 prehistoric sites. Additionally, 372 indistinct prehistoric sites (small lithic scatters and individual finds) were recorded by the prehistoric survey. Twenty-three of the sites, 18 prehistoric and 5 historic, are considered eligible for nomination to the National Register of Historic Places. Eleven of the prehistoric sites and one of the historic sites are located within the proposed life-of-mine area boundary with the remaining eligible sites situated in a surrounding one-mile buffer zone.

2. Prehistoric Sites

The factors contributing to the significance of the 18 prehistoric sites thought to be eligible for listing in the National Register are summarized in table III-22, which cross lists each of the eligible properties mentioned here with the inferred period of occupation. Inspection of the table shows that all listed archeological sites are significant because they have yielded, and may be likely to yield, important information in the study of Montana's prehistory.

The 18 prehistoric sites fall into two general categories. Nine of the sites are probably the remains of domestic activities by members of prehistoric communities. They are characterized by the presence of a wide variety of artifacts and in some cases stone features and animal remains. All are believed to possess important undiscovered information on community-wide residential activities.

The remaining nine prehistoric sites are the remains of specific activities of prehistoric communities. The activities inferred from tools collected include selecting and testing chipped stone materials and killing and butchering relatively large ungulate game. There are two exceptions in this group of nine. The first includes what is presumably the site of vision-questing activities. The second is the location of a prehistoric parietal rock art complex that possesses high artistic values that distinctively characterize a culture type and period. These nine sites are all believed to have the potential to contribute information on Great Plains prehistoric economics and culture.

3. Historic Sites

Sixteen historic sites were identified by archival research and or the inventories. All of these sites date in the period of 1881 to 1930. A majority of the sites (homesteads, ranches) were associated with agricultural development in the Tongue River Valley. A footbridge, grave, railway bed, and a Native American Reservation community round out the historic sites.

Five of the historic sites have been found eligible for listing in the National Register of Historic Places (Table III-22).

Three of the sites (24RB153,155,168) are associated with an early twentieth century (1910-1930) period of permanent white settlement in the Tongue River Valley. Each is a good illustration of patterns in the disposition of public lands, of farming practices and needs, of individuals important in early area affairs, and of building construction and farmyard arrangement. All three possess a high degree of site integrity. A fourth site (24RB158) is associated with the earliest white settlement of the area (late 19th century) and is important as a rare surviving reflection of that era. The fifth site is the Birney Day School Village (24RB164) representing an early attempt by the BIA to acculturate the Northern Cheyenne. Log structures at the site retain their integrity as well as having important architectural design qualities and compatibility of materials.

P. ESTHETICS

The Montco life-of-mine area covers a pastoral landscape typical of river valleys in southeastern Montana. The proposed mine area has no unusual scenic qualities and is similar to other scenes along the Tongue River. Farming and grazing is the principal human intrusion. The area varies topographically from the alluvial valley floor of the Tongue River to the west to gently rolling hills, plateaus, and sandstone outcrops to the east. There is moderate variety of color, including scattered patches of dark green pine trees, red scoria, and tan sandstone. Vegetation produces variations in patterns and textures. The predominant odors are those of the vegetation. Sounds are from vehicle traffic on the Ashland-Birney gravel road, livestock, wildlife, and wind.

Table III-22.--Sites eligible for the National Register of Historic Places

Site number	Site name	Location	Period
24RB215	Yellow Leaf	Buffer zone	Late Plains/Late Prehistoric
24RB221	King Creek	Permit area	Late-Middle Plains
24RB226	Katydid	Permit area	Late Plains
24RB230	Airport	Buffer zone	Paleo/Middle-Late Plains/Late Prehistoric
24RB232	Jamie's	Life-of-mine area	Late Plains
24RB233	Little Bone	Life-of-mine area	Late Plains/Late Prehistoric
24RB246	Bright Cloud	Life-of-mine area	Later Prehistoric
24RB248	Iron Graveyard	Life-of-mine area	Late Plains
24RB251	Autumn View	Buffer zone	Late Prehistoric
24RB211	Roof of the Tongue	Buffer zone	Unknown
24RB212	Scatter	Buffer zone	Late Plains
24RB228	Lost Grave	Life-of-mine area	Unknown
24RB229	Thru Rock Ring	Life-of-mine area	Unknown
24RB223	Fence Line	Permit area	Unknown
24RB234	O'Dell Bison Jump	Life-of-mine area	Late Prehistoric
24RB249	Amid Creek	Buffer zone	Unknown
24RB275	Spirit Rock	Buffer zone	Unknown
24RB217	Broken Tire	Life-of-mine area	Late Plains/Late Prehistoric
Historic			
24RB153	Byers/Schaudel Homestead	Buffer zone	1910-1930
24RB155	Jud McKelvey Homestead	Buffer zone	1910-1930
24RB158	Cotant/Scott	Buffer zone	Late 1880's
24RB168	Karl Knobloch Homestead	Life-of-mine area	1910-1930
24RB164	Birney Day School	Buffer zone	

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

A. GEOLOGY

1. Summary of Impacts

Geologic impacts of mining in the North King mining unit would be limited primarily to the removal of 25 million tons of coal and to a slight increase in erosion of topsoil from the longer and steeper reclaimed slopes. Proposed topsoil replacement techniques could lessen this latter occurrence; however, some erosion would probably be unavoidable. Adequate favorable overburden exists in the North King unit to cover the regraded spoils to a depth of at least 8 feet; however, separation of favorable from unfavorable material would require special overburden identification and handling techniques.

Reclamation over the remainder of Montco's life-of-mine area could cause similar geologic impacts, although this cannot be determined for certain at this time.

2. Topography and Geomorphology

Geomorphic impacts within the North King unit would be minor. The postmining topographic plan submitted by Montco (fig. IV-1) depicts a geomorphic surface which should be stable in a well-managed, postmining environment. Some planned hillslopes are steeper or longer than is ideal, but the necessity to match undisturbed and reclaimed surfaces makes this generally unavoidable. Such hillslopes, like those along the east edge of section 9 and the slopes adjacent to King Creek Valley, may experience erosion that would be largely avoided with special revegetation and topsoil replacement techniques. The proposed placement of coarse overburden on steep slopes would reduce the erosion to that equal to or only slightly greater than the present rate of erosion.

3. Mineral Resources

Approximately 25.5 million tons of coal would be mined from approximately 566 acres within the North King unit. The life-of-mine area calls for approximately 186.1 million tons of coal to be mined from about 9,800 acres of total mining and associated disturbance over a 22-year period. Coal mined from the North King mining unit and the life-of-mine area constitute about 12 and 85 percent, respectively, of the in-place coal resources estimated for the Montco mine.

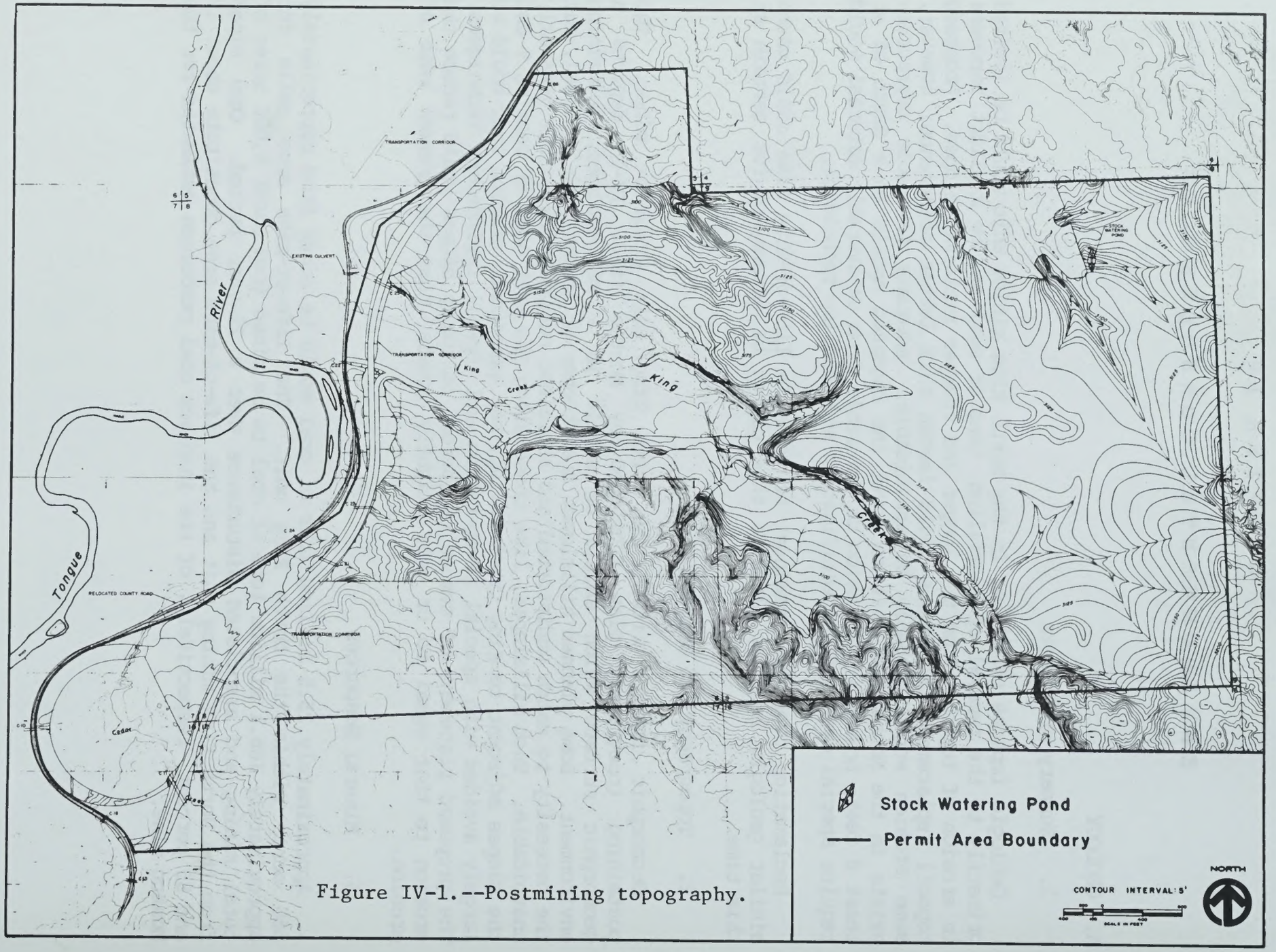

Figure IV-1.--Postmining topography.

a. Flowers-Goodale Coal Seam

Montco does not propose to mine the Flowers-Goodale Coal Seam, which lies at a depth of 140 to 240 feet below the Knobloch Coal. The Flowers-Goodale is of lower Btu content than the Knobloch and McKelvey seams. The stripping ratio of the Flowers-Goodale (the ratio of overburden thickness to thickness of the coal seam) exceeds the 5 to 1 economic limit for coal mining in this area. Although the Flowers-Goodale seam would not be mined owing to economic conditions, the nonmining of this seam does not represent a direct long-term loss of potential energy as economic factors indicate that the energy required to remove and replace the the interburden, remove the Flowers-Goodale coal, and to transport the coal to points of use would be equal to or greater than the energy that could be obtained from the coal.

The impact on energy supplies of not mining the Flowers-Goodale coal seam as a part of the Montco operation would be negligible. The impacts on geology, topography, and hydrology would be substantially increased, however, if the Flowers-Goodale coal were mined.

b. Federally Owned Knobloch-McKelvey Coal

Some relatively small deposits of federally owned Knobloch-McKelvey coal are present within the North King mining unit. The coal is within the "burned" area, and much of it probably is weathered. According to the Bureau of Land Management, this coal would not be "jeopardized" by the Montco mine because it would be available for mining when the Montco mine operation is terminated. (See appendix 5.) The mining of this Federal coal as an operation separate from and after the Montco operation probably would be less efficient than mining the coal as a part of the Montco mine. Mining of this coal separate from the Montco mine would not occur until the economics of coal production improve. The loss of efficiency that would result from the coal being mined separate from Montco's mining operation would have minimal adverse effect on energy supplies.

Several large blocks of economically extractable Federal coal involving 163 million tons (about 130 million tons after losses) lie adjacent to Montco's life-of-mine area. This coal is currently unleased. If this coal were leased in the future by the Federal Government and Montco received the lease, mining by Montco would be part of an expanded operation. The coal could also be leased by other operators.

The block of Federal coal which lies just north of the North King mining unit could be assimilated into Montco's operation after about the 8th year of mining. Thus, sufficient time exists for leasing and mining of the Federal coal before Montco would be in a position to extract it.

If Montco decides not to mine Federal coal and the coal is by-passed by Montco's operation, the 9 large blocks of economically extractable coal within adjacent to Montco's proposed life-of-mine area would not be jeopardized in terms of potential for future mining because the areas containing the 163

million tons of Federal coal alone would constitute a minable unit. Such a mining operation would be similar to Montco's proposed mine for the extraction of the non-Federal coal. As a separate operation conducted after the termination of Montco's proposed project, the mining of the federally owned Knobloch-McKelvey coal would be less efficient than mining as a part of Montco's operation. The impact on energy resources, however, of the mining of this Federal coal as an operation separate from the Montco operation would be negligible.

If Montco leases and mines the Federal coal and expands its mine, some increase in impacts would result. The geologic and hydrologic impacts would be roughly proportional to the increase in the size of the area that would be disturbed. If the life of the mine is extended over a longer period and the rate of mining does not increase, many other impacts would be of longer duration, but would not increase in severity. If the life of the mine is not extended and the rate of mining is increased, most impacts would be increased proportionately, but most would be minor to moderate, and the increased mining at this site would preclude the impacts that would occur if some other site were mined to obtain the same quantity of coal.

4. Additional Geologic Impacts

The existing stratigraphy down to the lowest coal seam mined would be replaced by a mixture of broken overburden and interburden (spoil). The existing stratigraphy is not unusual or rare and no significant paleontological resources are known to exist in the strata that would be mined or disturbed.

Mining would not interfere with development of other minerals or resources in the area, nor would mining likely create any geologic hazards.

5. Overburden

To avoid placing unfavorable material in the root zone, Montco proposes to selectively handle (sort) the favorable overburden material that would be used in the top 8 feet of spoil. Maps that show thickness and depth of favorable overburden would be used to identify and stake out zones of favorable overburden for the shovel operator. The drill-hole spacing used to identify favorable overburden for mapping provides about 80--87 percent accuracy in determining overall overburden quality.

Montco's proposed procedure would require a trained person in the field who would survey and stake the areas and provide guidance to the shovel operator. The favorable overburden would be directly backhauled and placed or stockpiled and eventually placed in the upper 8 feet of replaced spoil. Even with the use of maps, some unfavorable material could be removed along with the favorable and placed in the root zone. The scoops of a 32-yard shovel would probably not at all times be accurate in the removal process.

To minimize the possibility of placing unfavorable overburden in the root zone, the company would be required to check root-zone overburden prior to topsoil replacement in accordance with DSL requirements. Overburden would be sampled to an 8-foot depth once for every 2 acres of regraded material. Each sample would be taken in two separate 4-foot increments and analyzed for pH, salinity (EC), and sodicity (SAR). Material not meeting criteria for suitable root-zone overburden would be replaced or modified. As a mitigating measure, Montco could increase the overburden sampling rate to one sample every acre or greater to further reduce the possibility of placing unfavorable material in the root zone.

If the proposed procedures for overburden handling are successful and favorable overburden is replaced as an 8-foot root-zone layer over the replaced unfavorable overburden, the revegetation process would be successful and little or no adverse effects to vegetation or from erosion would occur. To the extent that some unfavorable overburden is placed in the 8-foot root-zone layer, some small patches of unsuccessful revegetation could result. The overburden in the root zone underlying these patches would be replaced by Montco. Impacts associated with placement of small quantities of unfavorable overburden in the root-zone layer would be temporarary and minor.

Much of the favorable overburden consists of "burned" material (scoria). This material is generally more coarsely textured than unburned overburden. Tests conducted by Montco indicate that this coarse textured overburden has a relatively high saturation percentage and this indicates that the material will not contribute to rapid drying of the soil zone when placed in the 8-foot root-zone layer beneath the replaced soils. These "burned" overburden materials are low in salt and sodium content. They would not contribute to droughtiness in the soils and they would not adversely affect the revegation process.

According to the permit application, Montco is planning to construct only one stockpile for North King unit overburden. Montco proposes to separate overburden within the stock pile into three zones--favorable, moderately favorable, and unfavorable--and to use a 150-foot buffer zone between the three types of overburden. Some mixing of overburden would occur within the buffer zone. The favorable overburden would be the last material removed from the stockpile. The favorable material would be used to cover the unfavorable and moderately favorable material and the material in the buffer zone in the final backfill of the North King unit. This would ensure that unfavorable material would not mix with favorable overburden. No adverse impacts to the 8-foot root zone layer would result from the proposed stockpiling technique.

B. HYDROLOGY

1. Summary of Impacts

Montco's drainage control plan must be in accordance with the Department of State Land's (DSL) administrative rules, which require that surface runoff from all disturbed areas be routed through sediment ponds. Montco's permit

application requires amendment to assure that required sediment control ponds are constructed on a schedule that would preclude drainage from leaving disturbed areas without draining through a sediment pond.

Reestablishment of the ground-water flow regime through spoils following mining may eventually cause increased dissolved solids concentrations in Tongue River streamflow. Theoretical increases during low flow conditions apparently will be less than one percent due to mining for Montco's entire life-of-mine area. In reality, such increases probably could not be measured. Streamflows greater than low flow conditions would effectively dilute increases to even lower levels. Cumulative hydrologic impacts resulting from mining by Montco, in conjunction with mining above the Tongue River Dam, would have no adverse impacts on agricultural water uses.

Neither mining in the North King unit nor construction of the facilities or railroad loop could result in measurable impacts on the Tongue River hydrologic system. McKelvey Spring may dry up during mining the North King unit. It is uncertain whether it would flow again following reclamation.

Extreme flood flows in King Creek and the Tongue River could fill a sediment pond in the King Creek drainage. However, sediment loading of the Tongue River during an extreme flood event would be so great that additional sedimentation from the North King mining unit would be negligible.

Ground water quality in resaturated, backfilled spoils would probably be of poor quality. However, alternative ground-water sources exist in the area that are sufficient to supply all foreseeable needs.

2. Surface Water

a. Sediment and Runoff

Runoff from all surfaces in the region occurs only in response to rainstorms and spring snowmelt, the timing and intensity of which are largely unpredictable. Runoff events may occur frequently in a given year, or may not occur at all. Montco has proposed surface drainage control for its North King unit. Although some minor adjustments in Montco's proposed drainage and sediment control system may be required, the final surface drainage control plan for the North King unit (fig. I-5) would have to route all drainage from areas of disturbed surface through sediment control structures. Similarly, Montco has proposed surface drainage control for surface facilities areas and the postmining surface.

b. Dissolved Solids Loads in the Tongue River

Following completion of mining and reclamation, the local ground-water system would reestablish itself and the spoils would resaturate. Ground-water flow would be through the spoils and toward the Tongue River. Ground water would move from the spoils, through adjacent undisturbed bedrock and clinker, and flow directly or indirectly into the Tongue River alluvium. This ground

water might ultimately contribute to Tongue River surface flow. Accordingly, increased dissolved solids in spoils ground water would eventually contribute to dissolve solids loads in Tongue River streamflow. Detailed discussion of potential mining impacts to the Tongue River are contained elsewhere in a report by Woessner and others (1981) and in a petition evaluation by Montana Department of State Lands and U.S. Office of Surface Mining (1982).

Based on two approaches and assumed "worst case" postmining hydrologic conditions, completion of all mining proposed by Montco would cause dissolved solids concentrations in the Tongue River at low flow to increase by, at most, two or three percent. Under higher streamflow conditions, increases in dissolved solids concentrations would be immeasurably small. A brief description of this approach follows:

(1) Montco calculated and submitted estimates in its application that dissolved solids concentrations in Tongue River alluvium down-gradient from the North King unit would increase by less than two percent, and increase in Tongue River low streamflows by approximately 0.1 percent. These values are within the margin of error inherent in water quality laboratory measurement techniques and are insignificant. Extrapolation of these results under assumed similar conditions for approximately 5,500 acres of mining over the life of the mine yields an estimated increase in Tongue River flow dissolved solids concentrations of less than one percent. This is also an insignificant increase.

(2) Using a quantitative model described by Woods (1981) and reasonable assumptions and estimates of premining hydrologic conditions, DSL indicated (oral communication, January 1984) that the increase in dissolved solids content of low flows of the Tongue River due to ground-water gains influenced by spoils leachate from all of Montco's proposed mining plus all anticipated mining would be small or insignificant.

Thus, both an estimate provided by Montco and an estimate calculated using another model (Woods, 1981) predict negligible impacts to Tongue River water quality by mining at the Montco Mine. Such small increases in dissolved solids loads would have no effect on uses of Tongue River water and no impact on irrigation or other agricultural uses.

c. Cumulative Hydrologic Impacts

Cumulative impacts to the Tongue River hydrologic system due to the Montco Mine, in conjunction with mining upstream in the Tongue River drainage, should be negligible to minor. In addition, the impacts would in all probability take decades to become evident or measurable. Three recent investigative efforts have been made of cumulative, long-term impacts to the Tongue River hydrologic system by present and future intensive surface coal mining in the region. Woods (1981, p. 48) concluded that "even with intensive mining the dissolved solids concentrations in the Tongue River [would] not increase substantially, nor [would] Tongue River water reach dissolved-solids concentrations unfit for irrigation supply."

Van Voast and Thompson (1982) analyzed the cumulative impacts to ten surface coal mines above the Tongue River Dam, approximately 30 miles upstream from the North King unit, and concluded that "dissolved solids in the river (at the dam) would increase by more than 30 mg/l about half the time, and that 10 percent of the time the increases would exceed 50 mg/l (Van Voast and Thompson, 1982, pp. 15-16). Such increases would have no impact on present downstream water uses.

In a comprehensive analysis of cumulative Tongue River water quality impacts attributable to intensive surface coal mining, DSL and the U.S. Office of Surface Mining (OSM, 1982) analyzed the potential for long-term and cumulative water quality degradation. This analysis uses the previously referenced model prepared by Woods (1981) and cumulative, mining-induced water quality changes in the Tongue River at the Tongue River Dam calculated by Van Voast and Thompson (1982). The DSL/OSM analysis concluded (1982, p. II-15) that various limited acreages of mining along the Tongue River, in conjunction with mining upstream from the Tongue River Dam, would increase dissolved-solids concentrations in the river by minor amounts, but that the suitability of the water for irrigation would be comparable to present conditions; that is, it would have a low to medium salinity hazard. Suitability of Tongue River water for irrigation may decrease downstream in the Miles City, Montana vicinity; however, it would still be suitable for irrigation of most crops under most conditions (DSL/OSM, 1982, Table II-5). It is important to note that the mining acreages assumed under the petition evaluation's limited mining scenario (DSL/OSM, 1982, Scenario 4, p. II-12, and Table II-5) are substantially greater than those proposed to be mined in Montco's 24-year mine plan. Hence, predicted water quality impacts for the petition evaluation's limited mining scenario are probably greater than those that would actually result from mining by Montco. Further, the petition evaluation concluded that under the limited mining scenario "The increase in TDS levels would be insignificant compared to projected TDS levels with increased irrigation in combination with no mining in the petition area" (DSL/OSM, 1982, p. II-15). Accordingly, projected changes to Tongue River water quality due to mining by Montco and elsewhere in the Tongue River drainage would have no effect on present water uses in the area.

Other cumulative hydrologic impacts due to mining development in the region would be minor and more localized. Such impacts would likely be limited primarily to occasional increased sedimentation in the Tongue River and its tributaries due to road and railroad construction and maintenance. Other impacts, such as water well and supply disruptions, would be very localized and minor.

d. Additional Impacts

Additional impacts that would occur to the surface hydrologic system from mining in the North King unit are less severe and less significant than those discussed above.

McKelvey Spring (Spring 35, fig. III-1) may dry up during mining. As stated in Chapter III, Hydrology, it is uncertain whether the spring's major source is the Middle Knobloch-McKelvey clinker area adjacent to the spring, or the Middle Knobloch and McKelvey coal seams discharging through clinker from the east. If it is the former, Montco's overburden stockpile could intercept most recharge and cause the spring to eventually dry up. Following mining and reclamation, recharge capacity might recover sufficiently to restore spring flow.

If the spring's source is the coal seams, mining would also cause the spring to dry up. Reestablishment of the postmining ground water flow system may eventually allow the spring to re-occur; however, this is not certain and the time required is unknown. In addition, water quality of the spring discharge may be degraded under these conditions.

Analysis of Montco's mine plan also indicates that extreme flood flows in King Creek or the Tongue River may fill the excavated sediment pond near King Creek, or the railroad loop in the case of Tongue River flooding. A sediment pond proposed by Montco encroaches upon King Creek's 100-year floodplain. Such a flow event may erode the pond structure and destroy it, causing minor downstream sedimentation. The sediment load of King Creek during a 100-year flood event would be very large and the additional sediment from the pond would be insignificant.

Montco proposes to construct its railroad loop on a portion of the Tongue River 100-year floodplain. The level of a 100-year flood would be below the level of the railroad bed and the velocity along the embankment of the rail-loop would not be sufficient to cause extensive erosion (D.A. Day, oral commun. Jan. 10, 1984). The statistical probability that a 100-year-recurrence-interval flood would occur at least once in the planned 24-year life of the railroad loop is about 21 percent.

The Tongue River reservoir, about 40 miles upstream from the proposed Montco Mine, has been classified by the Montana Department of Natural Resources and Conservation as a high hazard dam. The spillway of the reservoir could not safely pass the probable maximum flood (Montana Department of Natural Resources and Conservation, 1982). If breached, the Tongue River Valley would be flooded by the water contained in the reservoir and the flow in the River resulting from the storm event that caused the breach. The area of the Tongue River Valley adjacent to the Montco mine that would be flooded if the spillway were breached is shown on map 7 of the appendix of inundation maps of the report, prepared for the Montana Department of Natural Resources and Conservation in 1982. This map indicates that the flood wave resulting from the breach of the dam would not inundate the facilities associated with the Montco mine. Thus the flooding resulting from the breach would have minimal impact on Montco's proposed operation. See also discussion on public safety in section on "Social Conditions." Montco's mining operation would also have neglible effect on the flood wave.

One stock pond in section 9 would be removed during mining in the North King unit. However, Montco proposes to reestablish it during reclamation.

Montco's placement of its facilities area and railroad loop on the Tongue River alluvial valley floor would have no measurable impact on the Tongue River hydrologic system. Some agricultural fields would be removed from production, and surface recharge to the alluvial aquifer over the facilities and railroad loop areas would be decreased. However, the sheer size of the Tongue River alluvial system makes these impacts insignificant.

3. Ground Water

Impacts to ground water resources due to mining in the North King unit would be minor: Two wells (numbers 33 and 57 on figs. III-1 and III-2) would be removed for construction of the railroad loop. Also, during mining, ground-water flow through the North King unit would be intercepted by the active pit, and water levels in the coal seams would be lowered around the mine site. The well owned by B.M. Haley, which lies just north of spring 3, is reported to be a flowing well. The flow indicates that it may tap the "Lance" aquifer. If it taps the Lance, water levels will not be affected by the lowering of water in the coal seams. If the well taps alluvium along the Tongue River, then the lowering of water levels would be small. Such lowering would not preclude the use of the well for water supply. A well owned by the U.S. Forest Service is about 2 miles east of the North King unit. If this well taps the coal beds, water levels probably would be lowered only a few feet due to the distance of the well from the mine and the low permeability of the coal beds. Neither of these wells is shown on figures III-1 or III-2. Remaining wells in the North King vicinity are either abandoned or are completed in hydrogeologic units which would not be impacted by mining.

Montco proposes to withdraw about 29,000 gallons per day (an average of about 20 gallons per minute) of ground water from the Hell Creek aquifer for domestic supply. Montco will apply to the Montana Department of Natural Resources and Conservation (DNRC) a water use permit on the Tongue River and is discussing the purchase of about 400 acre feet of water per year from the Tongue River with DNRC. The withdrawal of 400 acre feet of water from the Tongue River would have negligible effect on the availability of water from the river.

Following mining and backfilling of the pit, the local ground-water system would reestablish itself and saturate the spoils. Ground-water flow would reestablish itself toward the northwest and the Tongue River. Although current technology is not sufficiently advanced to make accurate predictions of postmining ground-water quality in the saturated spoils, it would probably have increased dissolved solids concentrations. Because the reestablished ground-water gradient would be toward the Tongue River, postmining spoils water would eventually reach the Tongue River Valley to the northwest.

Two techniques provide estimates of postmining spoils ground-water quality at Montco's North King mining unit. Systems Technology (1982) analyzed overburden extract data for DSL using an approach developed by Van Voast and others (1978), as well as an additional technique developed by Systems Technology.

The Van Voast technique (1978) provides a 95 percent confidence limit about the three major cation concentrations found in shallow ground waters of southeastern Montana. A very rough approximation of the range of dissolved solids concentration of these spoils ground waters is 2,700 to 11,000 mg/l. This is calculated by assuming that the three major cations (calcium, magnesium, and sodium) represent all or most of the cation species present, which is a realistic assumption, and by also assuming that bicarbonate would comprise the total anion concentration, which is also a reasonable assumption for this purpose.

Utilizing another approach, Systems Technology (1982, table 9) predicted North King unit spoils ground water would have a specific electrical conductivity of about 4,500 umhos/cm. (See appendix 7, MDSL, 1982d.) Such a conductivity value approximates a dissolved solids concentration of 3,000 mg/l, which is within the range reported above for the Van Voast technique.

These predicted water quality parameters for spoils ground water in the North King unit are generally within the premining range for coal and interburden ground-water units in Montco's life-of-mine area (table III-9). The higher predicted values for spoils ground water are greater than the higher values currently found in the area. Observations made in mined areas where spoils water quality measurements have been made indicate that ground water within spoils is generally of poorer quality than premining ground water in the area (Van Voast and others, 1978).

It should be noted that the spoils water dissolved solids concentrations predicted above are generally less than the assumed value of 10,000 mg/l used in calculating potential increases in dissolved solids concentrations in the Tongue River. (See appendix 5, MDSL, 1982d.) Accordingly, predictions of water quality degradation in the Tongue River due to mining by Montco (see Surface Water) may be overstated.

Predictions of spoils water quality for the remainder of Montco's life-of-mine area should also be considered only approximations, like those noted above for the North King unit. In general, both the Van Voast technique and methods developed by Systems Technology (1982) suggest that spoils water quality would be markedly worse in the vicinity of O'Dell Creek than elsewhere in Montco's life-of-mine area. However, greater accuracy and more definite predictions cannot be attained at this time due to lack of more specific hydrologic data and mining plans.

Alternative ground-water sources are available throughout Montco's life-of-mine area, and Montana law requires a coal company to replace water supplies destroyed by mining. No additional on-site impacts of significance are expected beyond those of water quality in backfilled spoils. See Surface Water for a discussion of related off-site imacts.

4. Alluvial Valley Floors

The valley of King Creek, which flows diagonally across the southwest part of the North King mining unit is underlain by a substantial quantity of alluvium. Although the geologic criteria for an alluvial valley floor determination are present, tests made along the creek failed to confirm the presence of subirrigation in the valley, an additional criterion, and local ranchers indicated that the flow of King Creek is not reliable and would not provide for irrigation. (Montana Department of State Lands, 1982). In addition, storm flows of the creek would make it difficult to construct and maintain the diversion structures and conveyances needed to divert water from the creek to potential areas of irrigation.

Since the valley of King Creek fails to meet the agricultural criteria of an alluvial valley floor and since "the chemical characteristics of the soils along the floor are generally not suited to intensive agriculture" and "water quality is marginal," the Montana DSL determined that King Creek is not an alluvial valley floor.

The Montana Department of State Lands (MDSL; 1982) determined that the valley of the Tongue River, where Montco proposes to place a rail loop, soil stockpiles, and a portion of the load out facility, is part of the Tongue River alluvial valley floor (AVF). However, Montco's proposed surface disturbances to the AVF would not affect the hydrologic balance and the disturbances would not significantly affect farm/ranch operations.

Montco's proposed operation would have no long-term impact on the hydrologic balance on the Tongue River AVF as the eventual removal of the railroad loop as planned by Montco will again restore the surface of the alluvial valley floor.

C. SOILS

1. Summary of Impacts

Some impacts on the soils at the proposed Montco mine would be unavoidable during the mining operation. These impacts include loss of the natural soil profile, soil structure, organic matter, pore space, and pore continuity. These could result in increased runoff and erosion rates, reduced infiltration and percolation rates, and reduced water-holding capacity for an unknown time following reclamation.

Because of these unavoidable impacts, the area would probably be more sensitive to mismanagement and drought than before disturbance, for perhaps several decades after mining. Long-term impacts (more than several decades after mining) are uncertain, owing to limited information and experience on the practices required for long-term success. (See also Vegetation.)

2. North King Mining Unit

a. Soil cover, depth, and quality

Montco proposes to salvage about 694 acre-feet of soil from the North King mining unit. (See table IV-1.) (As used in this text, "soil" will include both topsoil and subsoil.) This would provide an average soil cover depth of about 17 inches for reclamation. In the latest revision to the Montco permit application, soil salvage depths have been modified to eliminate salvage of unfavorable soils with elevated levels of soluble salts, sodium, and clay, or a combination of all three. Soil salvage depths (table IV-1) reflect the salvage of only the most favorable soil materials. The use of these favorable soil materials over at least 8 feet of favorable overburden would provide a suitable growing medium for plants (see Vegetation).

A study of surface mine reclamation in the northern Great Plains (Barth and Martin, 1982), shows that optimum vegetative productivity can be obtained with about 20 inches of good-quality topsoil, when placed on overburden that is free from chemical or physical problems. When the overburden has excessive sodium, salts, clays, or acid-forming materials, more soil cover may be needed (Schuman and Power, 1981). The overburden that Montco would replace would not have excessive amounts of those materials (see Geology). Another study (Power and others, 1978) indicated that crop yields increased as soil depth was increased to 35 inches; however, considering the quality of the overburden Montco would place in the rooting zone, the proposed average soil cover depth of 17 inches should permit successful reclamation.

Whenever possible, Montco intends to direct haul the soil material to help eliminate the loss of organic matter, soil microorganisms, and other deleterious effects that can result from stockpiling.

Montco has proposed a pre-salvage soil sampling program. This pre-salvage program of soil sampling and analysis would help to further define sources of suitable soil materials beyond those identified in the baseline soil survey and analysis. The program will be conducted by a soils specialist or a trained member of Montco's resident environmental staff (Montco revised permit application - Chapter IV, page IV-2-1).

b. Soil Erosion

The proposed postmining topography would consist largely of gentle (0 to 10 percent) slopes. But short slopes of 15 to 35 percent would lie throughout the unit, proposed for the sides of reconstructed drainages and for the edges of the mine area where steeper slopes are necessary to match the surrounding undisturbed topography.

Montco has committed to redistribution of subsoil and topsoil materials at varying depths in the different reclamation areas (revised permit application, table IV-3A). Specifically, soil depth and texture would be varied for ponderosa pine, sidehill bunchgrass, and drainageway revegetation

Table IV-1.-- Soil that would be disturbed in the proposed permit area [1]
[Proposed salvage volumes in acre-feet for primary, secondary, and tertiary lifts and total soils]

	Mapping unit[2]	Acres to be disturbed	Percent of total to be disturbed	Primary lift (topsoil)	Secondary lift (subsoil)	Tertiary lift (tree materials)	Total soils	Precent of total salvage volume
02A	Havre L	3.27	0.49	1.3	11.8	0.0	13.1	1.34
05A	Harlem CL	7.28	1.08	2.9	26.2	0.0	29.1	2.99
06A	Glendive SL	0.24	0.04	0.1	0.7	0.0	0.8	0.08
1D	Busby SL	1.64	0.24	1.6	6.6	0.0	8.2	0.23
2D	Vanda Variant C	4.37	0.65	0.0	2.2	0.0	2.2	0.22
4D	Busby SL	17.76	2.65	17.7	35.5	0.0	53.2	5.46
12D	Kirby GRSL	21.82	3.25	0.0	10.9	20.1	31.0	3.18
12DL	Birney SL	11.14	1.66	8.9	0.0	0.0	8.9	0.91
23C	Pinelli Variant L	5.86	0.87	2.9	8.8	0.0	11.7	1.20
37C	Yamac Sl	17.32	2.58	8.6	60.7	0.0	69.3	7.11
37DC	Yamac CL	60.22	8.97	30.1	228.8	0.0	258.9	26.57
59C	Kobar CL	57.86	8.62	43.4	0.0	0.0	43.4	4.45
69C	Dollard L	35.23	5.25	17.6	0.0	0.0	17.6	1.81
128F	Grobutte-Patent Complex	13.60	2.03	6.8	0.0	0.0	6.8	0.70
400	Yamac-Havre L	32.09	4.78	16.1	128.4	0.0	144.5	14.83
493E	Dollard-Blazon Complex	54.23	8.08	27.1	43.4	0.0	70.5	7.24
511C	Benz CL	0.26	0.04	0.1	0.2	0.0	0.3	0.03
513C	Tisworth L	3.28	0.49	1.6	0.0	0.0	1.6	0.16
X03A	Glendive-Glendive Variant	3.91	0.58	3.9	22.5	0.0	26.4	2.71
X3C	Cooers-Rentsac Variant	21.75	3.24	10.8	69.6	21.8	102.2	10.49
Z12E	Kirby Variant-Rentsac Variant	149.38	22.26	0.0	0.0	74.7	74.7	7.67
CRO	Clinker Rock Outcrop	7.34	1.09	0.0	0.0	0.0	0.0	0.0
SRO	Sandstone Rock Outcrop	3.36	0.50	0.0	0.0	0.0	0.0	0.0
DL	Disturbed Land	6.95	1.04	0.0	0.0	0.0	0.0	0.0
184F	Dollard Variant-Blackhall Complex	86.50	12.89	0.0	0.0	0.0	0.0	0.0
W	Water	1.15	0.17	0.0	0.0	0.0	0.0	0.0
Topsoil stockpiles		43.28	6.45	0.0	0.0	0.0	0.0	0.0
Totals		671.09	99.99	201.5	656.3	116.6	974.43	100.00

[1] Table does not include soils that will not be disturbed by mining or associated activities.

[2] Abbreviations used in mapping unit names: C = clay; CL = clay loam; L = loam; SL = sandy loam; GR = gravelly.

[3] Of the 974 acre feet salvaged from the permit area, 280 acre feet would come from the facilities area and 694 acre feet would come from the mining area.

communities. The distribution of the soils in this manner should reduce the possibility of accelerated soil loss due to erosion. Finer textured soils would be used for drainageway reclamation, thus reducing the possibilty of soil loss, from erosion, of these more erodible soils. Also, since only about 20 percent of the soils are sandy-textured and would be stockpiled with soils of finer texture, the mixing of the soils should reduce the possibility of erosion from these more sandy textured soils, even on steeper slopes. Because much of the topsoil replacement would be direct haul, the potential erosion by selectively placing topsoil would be reduced.

c. Tree-lift Material

Table IV-2 shows that at least 117 acre-feet of tree-lift material will be available for reestablishing tree communities. Tree-lift soils are those that contain a high percentage of coarse fragments or that supported a ponderosa pine/Rocky Mountain juniper community prior to mining. Ongoing studies at Colstrip have suggested that some rock fragments in the soil, especially near the surface, aid in water retention and tree growth, providing that the rock fragments are neither porous nor calcareous (Stark, 1982). The amount of tree-lift material available throughout the North King unit is sufficient for proposed tree community reclamation.

Within the North King unit, there is one mapping unit that would be disturbed, but the soils would not be salvaged (table IV-2). This is the Dollard variant-Blackhall complex and comprises about 87 acres of the area. The Dollard variant-Blackhall complex would not be salvaged due to the very steep slopes, the clayey textures, shallowness to rock, and saline-alkaline characteristics. The Kirby variant-Rentsac variant, a very gravelly sandy loam complex, would be salvaged primarily for tree-lift material. This is due to the high volume of coarse fragments and shallow depths to rock. Some of this soil series would also be used for the ponderosa pine/Rocky Mountain juniper and sidehill bunchgrass revegetation communities. Some of the tree-lift soils would be mixed with soil fines to improve overall quality.

3. Proposed Facilities Area and Railroad Transportation Corridor

a. Soil Cover

Montco proposes to salvage about 280 acre-feet of soil from the facilities area and railroad transportation corridor (Table IV-2), providing an average soil cover depth after redistribution of about 20 inches. Because Montco has committed to salvaging only the most favorable soil, and on the basis of pre-salvage inventory and analysis (see section 2), adequate soil is available for reclamation of the proposed facilities area and railroad transportation corridor. This conclusion also is based on field studies and research cited in section 2.

b. Soil Erosion

The proposed postming topography of the facilities area consists of slopes of 5 to 25 percent. Seventy-five percent of the soil proposed for salvage is sandy-textured. However, as discussed in section 2, Montco has committed to redistribution of subsoil and topsoil materials on varying slopes. This should reduce the possibility of accelerated soil loss due to erosion. Also, by utilizing the direct haul method of soil replacement, selective placement of topsoil can be accomplished to reduce the erosion risk. Further, at least one of the sandy-textured soil series (the Busby) has a large proportion of fine and very fine sands which are comparable in erosion hazard to silty soils--that is, they are more subject to erosion than other sandy soils with coarser sand fractions.

c. Tree-lift Material

At least 117 acre-feet of tree-lift material would be available for reestablishing tree communities and the sidehill bunchgrass community in the facilities area and Railroad Transportation Corridor (table IV-2). Montco would store the best of the tree materials and mix them with soil fines.

d. Prime Farmland

Montco plans to salvage and store separately the approximately 8 acres of potential prime farmland soils that would be affected by railroad loop construction. The company would handle this material in accordance with DSL requirements.

e. Soils Not Salvaged

There are two mapping units in the facilities area and railroad transportation corridor that would be disturbed, but the soils would not be salvaged or would be only partially salvaged (table IV-2). They are the Dollard variant-Blackhall complex and the Tisworth loam. The Dollard variant-Blackhall complex would not be salvaged due to the very steep slopes, the clayey textures, shallowness to rock, and the saline-alkaline characteristics. The Tisworth loam would only have the surface 6 inches salvaged because of the high salt content below 6 inches clayey textures in the substrata.

4. Soil Stockpile Stabilization

Measures to control erosion of soil stockpiles would depend on the life of the stockpile. Stockpiles to last less than 90 days would simply be roughened to retard wind and water erosion; the surface would not be revegetated.

Stockpiles to last longer than 90 days but less than one year would be (1) disced and/or harrowed to prepare the seedbed and (2) drill seeded using the "one contour pass" drilling method, except for the 33 percent side slopes,which would be broadcast seeded during the first appropriate season. The seed mixture used would be a temporary cover crop, such as Horsford barley, Otis barley, Cayuse oats, or wintergraze. If compacted, the surface of the stockpile would be ripped to a depth of 24 inches prior to discing.

Stockpiles to last longer than one year would be seeded to a permanent grass mixture and mulched. Seedbed preparation would take place as above, except that 40 pounds per acre of phosphorus fertilizer would be broadcast over the soil prior to discing or harrowing. The stockpiles would then be seeded with eight pounds slender wheatgrass, eight pounds streambank wheatgrass, eight pounds thickspike wheatgrass, and two pounds of cicer milkvetch per acre. The stockpile surface would be straw mulched at two tons per acre and anchored. When stockpile outslopes are too steep to allow efficient drill seeding and straw mulching, broadcast seeding and hydromulching would be used.

D. VEGETATION

1. Summary of Impacts

Based on Montco's proposed reclamation plan, revegetation is expected to succeed in reestablishing effective ground cover. There would be some loss of vegetative diversity at first, followed by a gradual return to near premining diversity over the long term. Ponderosa pine survival may be only 60 percent after 4 years. Over the long term, survival may be limited to about 50 percent. This would not be a problem so long as Montco's plantings contain adequate numbers to compensate for the expected survival rate for pine. Impacts on vegetation several decades after reclamation are expected to be minimal.

2. North King Mining Unit

a. Revegetation

All vegetation would be removed from active mining areas during mine development. For reclamation Montco has proposed five vegetation areas: (1) ponderosa pine/juniper, (2) big sagebrush/grassland, (3) sidehill bunchgrass, (4) sod-forming grassland, and (5) drainageways. The species included in each area are given in appendix 1. These species were selected on the basis of premining vegetation, soil and wildlife inventories, commercial seed availability, and a literature review of appropriate reclamation publications.

Seed for some species identified as dominant in the premining vegetation inventory is not commercially available in quantity, so substitutes were selected, based on adaptability to expected soil and climatic conditions. Additional species were also added to some seed mixtures, based on importance to wildlife as cover and food. Appendix 1 lists each species variety and its primary locations on the site, soil adaptation, tolerance to salinity and alkalinity, wildlife value, palatability to cattle, method of establishment, and proposed postmining area of establishment.

b. Soil and Overburden Relationships

Sufficient topsoil and overburden exists on the area for successful revegetation. Montco is committed to placing an average of 17 inches of soil and 8 feet of favorable overburden material throughout the reclaimed area. After backfilling, 1 soil sample per 2 acres will be taken to insure that soils meet DSL guidelines. Where they do not, Montco must replace the soils with some that do meet these guidelines. Therefore, Montco's overburden handling procedures are expected to insure that only soils suitable for revegetation are placed in the root zone.

The procedure for locating favorable overburden involved analysis of drill cores and developing isopach maps of favorable materials. To separate and stockpile these favorable materials, a soil scientist, using the isopach maps and stakes, will direct the shovel operator in the excavation. The favorable materials would be separated and stockpiled for backfilling, or in some instances, direct hauling to the backfill area would be used.

Soil removal, storage, and replacement would result in losses of soil structure and reduction in organic matter, and water infiltration is initially expected to decrease. Overall, conditions fully suitable for revegetation are expected to be achieved.

c. Erosion Effects

Montco proposes placement of subsoil and topsoil in varying depths according to revegetation type (see Soils). Also, Montco has committed to placing finer textured soils in the drainageways which should help reduce accelerated soil loss due to erosion.

To minimize erosion, the company proposes to use annual cover crops and straw mulch to stabilize the reclamation areas until a permanent vegetative cover is achieved. Although such measures would reduce sheet and rill erosion on steep slopes and in drainages, they would not entirely prevent it, nor would they prevent gully erosion. If a heavy rainstorm or rapid snowmelt were to occur before cover vegetation was well established, significant areas of vegetation could be destroyed, and significant soil loss could occur. This would be mitigated by the company's replacing subsoil and topsoil according to revegetation type. This procdure should more closely put soils back in a similar premining position in the landscape. Also, by using the direct haul method of soil replacement (whenever possible) Montco can selectively replace soils in the landscape to reduce the erosion hazard.

d. Premining and Postmining Habitat Comparisons

Table IV-2 compares premining and postmining acreages of vegetation/habitat types. This table includes the proposed facilities area. The big sagebrush/grassland type would increase by about 64 acres, the breaks (steep slopes often with coniferous habitat) decrease by 64 acres. The remaining types would remain about the same size with minor changes due to the proposed postmining topography, drainage system, and homestead removal.

Table IV-2. Proposed permit area* comparison of premining versus postmining vegetative types and wildlife habitat types.

Postmining vegetation type	Wildlife habitat types	Disturbed acreage	Reclaimed acreage
ponderosa pine/juniper	ponderosa pine/juniper	115	115
big sagebrush/grassland	big sagebrush/grassland	238	302
bunchgrass sod-forming grassland	bunchgrass sod-forming grassland	164	158
drainageways sod-forming grassland	silver sagebrush/grassland	20	25
steep slopes	breaks	72	8
alfalfa	---	19	19
homestead	---	0	0
water	---	2	3
	Total**	630	630

*North King mining unit and facilities area.
**Includes about 9 acres of county road disturbance, 566 acres of mining level disturbance, and 74 acres of facilities area disturbance. Does not include disturbance from railroad transportation corridor.

e. Range Condition and Stocking Rates

The premining potential would average 0.26 cow-calf units per acre, or 312 cow-calf units for a one-month grazing period. For several decades after mining, grazing capacity of the reclaimed land would probably not be as high as the premining potential under optimum management. However, it would probably be higher than the premining grazing capacity. This slight reduction in optimum grazing capacity would occur because of loss of soil structure, organic matter, pore continuity, and other unavoidable mining impacts on soils. If managed properly, however, the condition of the reclaimed land would be better than its current (low-good) condition.

f. Irrigation

Annual precipitation at the Montco Mine plan area is low, ranging from 6 to 20 inches and averaging about 13 inches over the last 24 years. (See Chapter II, Climate.) About one-fifth of the soils in the North King mining unit are sandy loam or coarser. These two factors, combined with the high evapotranspiration rate, create a situation where available moisture in the soil is low. Woody species are most affected by this, in part because tree roots are sometimes damaged during transplanting.

To enhance reclamation success of woody species, Montco proposes to water tree transplants during periods of moisture stress for about two years. Stress would be monitored weekly, spring through fall, to determine when moisture is inadequate. An unsurfaced path, passing adjacent to each grove of transplants, would provide access for watering. The path would be reclaimed following the end of irrigation, using species from establishment areas 1 through 4 (See appendix 1). These procedures are expected to enchance tree survival and minimize long-term impacts of loss of coniferous habitat.

g. Manure Application

For the drainageways community, Montco proposes to use manure, if available, to add nutrients to the soil and increase infiltration and water-holding capacity. If manure is properly incorporated into the soil, it would have a beneficial impact on revegetation.

3. Other Disturbed Areas

a. Facilities Sites

All vegetation would be removed from the facility site construction areas during mine development. Following abandonment, all structures, concrete footings, and the like would be removed. The area would then be graded to about the original contour. Areas stripped of vegetation and compacted from construction or travel would be ripped to a depth of 2 feet or disced. Discing alone may not adequately alleviate compaction problems. Ripping to a 2-foot depth and then discing should mitigate most of the compaction problems. The soil would be respread, and the area would be seeded and mulched. Fertilizer would be added at appropriate times at rates dictated by soil analysis.

b. Roadbeds

Following road abandonment, all roadbed surfacing materials and culverts would be removed and the area graded to about the original contour. The area would be ripped to a depth of 2 feet, soil would be respread; a seedbed would be prepared; and the area would be reseeded. Straw mulch anchored into the seedbed at a rate of two tons per acre would be used to control erosion. The area would be seeded, depending on its location, with species listed for postmining areas 1 through 4 (Appendix 1). Fertilizer would be added at appropriate times at a rate dictated by soil analysis.

c. Overburden and Soil Stockpile Sites

Following stockpile removal, overburden stockpile sites would be reclaimed in the same way as roadbeds, except that a cover crop, drill seeded along the contour, would replace the straw mulch as an erosion control measure.

Soil stockpile sites would be reclaimed in the same manner as overburden sites, except that soil replacement would be unnecessary, since soil would not be salvaged prior to stockpiling.

d. Temporary Sediment Ponds and Diversion Ditches

Temporary sediment ponds would be removed after mining when (1) the upstream drainage area has been stabilized, (2) revegetation standards have been met, and (3) acceptable water quality has been attained. To begin reclamation, each pond would be dewatered and bottom sediments would be analyzed for toxic properties using DSL overburden guidelines. If the sediment were non-toxic, the entire pond would be graded to about the original contour. If the sediment were toxic, it would be removed and buried under 8 feet of non-toxic material before grading and topsoiling. Revegetation would take place in the same way as for roadbeds, except without ripping.

e. Prime Farmland Reclamation

Following abandonment of the railroad loop, all fill materials would be removed. The surface would then be ripped to a depth of 2 feet to eliminate compaction and graded level for spreading of soil. Soil would be laid (1) in the thickest possible lifts to decrease compaction; (2) to achieve an uniform thickness; (3) to minimize erosion and contamination; and (4) to minimize deterioration of the biological, chemical, and physical properties of the soil. Each lift replaced would be tested for excessive compaction.

Revegetation would follow techniques similar to those discussed earlier, except that different species would be planted: Montco is proposing to return this land to its primary use as hay meadow rather than to native rangeland. This would allow postmining land use to be the same as premining land use and would be compatible with adjacent lands. Native range grasses would not attain desired results, as they are generally less productive than the alfalfa-grass hay mixture and are adapted to drier conditions.

The currently irrigated hay meadow in Section 18 that would be disturbed by the loop would be irrigated again after the railroad is removed. The hay meadow in Section 7 is currently not irrigated. Whether to irrigate after removal of the railroad would be decided between Montco, the landowner, and DSL.

Prior to reclamation of the irrigated hay meadow, the landowner would be contacted to determine planting specifics. Initially, Montco proposes to seed Regar brome grass, orchardgrass, and Thor alfalfa. The target production rate would be 3 to 4 tons of hay per acre where irrigated and 1 to 1.5 tons per acre where unirrigated. To determine success, comparison test plots would be established on similar soils on adjacent areas. The average annual crop production on reclaimed prime farmland areas would be determined based on a minimum of 5 years of data. This level of crop production would be compared to the test plots, and if the production levels were equivalent or higher, revegetation would be considered successful (26.4.815 MCA).

E. AQUATIC BIOLOGY

1. Summary

Aquatic habitats within the North King mining unit would be removed without detrimental effects to regional aquatic ecosystems. No significant degradation of water quality or aquatic populations in the Tongue River is anticipated.

2. Description of Impacts

Because of the ephemeral nature of the aquatic system found in the life-of-mine area, direct impacts on aquatic organisms from habitat disruption would not be significant. Although McKelvey spring and water tanks and the algae and insects associated with them would be removed from the North King mining unit, such aquatic habitats as well as the plants and animals that utilize them are in general limited in number and distribution. The organisms that would be eliminated probably can be found upstream from proposed disturbance areas, and would recolonize the area after reclamation.

Off-site impacts are expected to occur through surface runoff and ground water discharge to the Tongue River. Once coal has been removed and spoils replaced, the local ground water system would flow into the Tongue River after passing through spoils. Contamination through ground water is not expected to result in a large increase in either total dissolved solids or electrical conductivity. (See Hydrology). Computer modeling indicates that electrical conductivity after mining may be similar to the existing conditions. Increase in TDS is expected to be about 1 percent for the North King unit and 3 percent for the mine plan area. This level of change would result in negligible effects (L. Bahls, Montana Water Quality Bureau, pers. comm., April 1982).

Surface runoff is also expected to contribute to a lowering of water quality. DSL requires control of runoff from all topsoil and overburden stockpiles. The Department has found that surface waters would not be adequately contained under the current proposal. Resolution of this problem, as required by law, should prevent accelerated sedimentation and potential adverse impacts to fish and aquatic organisms in the Tongue River. (See Hydrology).

It is unlikely that the aquatic system would be significantly changed as a result of mining activity in the North King mining unit. There may be additional secondary impacts, however. The influx of people to the area could result in increases in nutrient (nitrogen and phosphorus) loading within the Tongue River. However, most people are expected to live in Ashland, where sewer treatment facilities are available. The current two-cell facility does not discharge and the second cell is practically dry, with adequate capacity for expected population growth.

Fisheries in and near the Tongue River may be adversely affected by an increase fishing. Recreational activities on the Tongue would increase and as a result fish populations may be stressed.

F. Wildlife

1. Summary of Impacts

General impacts--More people in the area would result in a greater legal and illegal harvest of wildlife; however, this would not jeopardize the wildlife population. The most important habitat, the riparian community, would not be mined because no economically recoverable coal underlies this habitat. The coniferous habitat, which occurs in the transition between the riparian and upland bench, and in stands and elevations on the upland bench, would be only partially mined for the same reason. Therefore, most mining would occur in the upland bench habitat. About half of the permit area would not be disturbed.

Area being actively mined--The animals depending on occupying this area would be displaced. Some losses of individual animals may occur if displacement increases competition for critically needed habitat, but even so, no species in the area would be jeopardized. Raptors and predators would lose some hunting habitat and sharp-tails would lose some nesting habitat, but the overall, long-term impacts would be minor.

Area adjacent to active mining--There would be virtually no impact on animals adjacent to the areas being actively mined, except in rare instances involving a species that strongly avoids man. The only likely candidate for this avoidance behavior is the bobcat, few of which occur in the area.

2. Habitat Use

Riparian habitat was used by white-tailed deer and pheasants for food and cover, by raptors for nesting and feeding, by small and medium mammals, by mule deer from late summer through mid fall, and in winter by sharp-tailed grouse and many small birds. This habitat type is very limited in southeastern Montana.

Coniferous habitat was used for cover by mule deer year around and by white-tails in winter. As raptor nest sites, this habitat was second to riparian habitat.

Upland bench habitat was used by antelope from spring through fall, by mule deer year around, by sharp-tailed grouse, (but dancing grounds were outside of the life-of-mine area), by small birds and mammals including prairie dogs, and by coyotes.

3. Description of Impacts

Wildlife depends on vegetation for food and cover, with each species using different parts of the environment. Change within the vegetative community changes wildlife populations. To understand the impact of such changes requires an assessment of how existing habitat components are used before mining, the manner in which components will be changed, and the nature of the postmining environment. The three major habitat types and the use by wildlife have been described in Chapter III. Since the riparian habitat would not be disturbed, the discussion of impacts is thereby reduced to the remaining two, i.e., coniferous and upland bench communities. The coniferous community would take longer to restore because it is comprised of mature trees. This issue is diminished, however, because much of this community will not be mined. In the permit area, about two thirds of the coniferous community will remain undisturbed. In the life-of-mine area, the acreage of undisturbed coniferous habitat would diminish toward the south. Therefore, most of the disturbance would occur on the upland bench, and this would be the easiest to reclaim to a condition similar to the natural landscape because the plants require much less time to mature. The immediate impact on wildlife would be the loss of use of that area scoured of vegetation and the loss of some habitat diversity. These losses would remain until the area was reclaimed.

One goal of current reclamation practices is to restore plant cover as quickly as possible. The Montco permit application calls for reclamation to begin in year 6, thus habitat destruction due to the actual mine cuts would be a relatively short-term impact. Habitat loss attributed to construction of the facilities area would be longer, since the facilities area could remain in place for 22 years. Approximately 115 acres would be disturbed in the facilities area; 41 would not be reclaimed but would remain as a transportation corridor.

Changes in habitat would also cause long-term impacts. Table IV-4 presents the total acres of disturbance and the habitats affected. A portion of the ponderosa pine habitat (115 of 334 acres) would be disturbed and reclaimed to pine. The removal of pine would be a compositional change resulting for several decades in a reduction in the populations of bird species that depend on this habitat. Primary cavity nesters such as woodpeckers, which excavate cavities, and secondary nesters, which use existing cavities, would be displaced. The secondary cavity nesters include chickadees, nuthatches, mountain bluebirds and the American kestrel. Reclaimed habitat would include mourning dove nest cones, kestrel nest boxes, and dead trees for perching. Boulders and brush piles would supply microhabitats for small mammals, the main prey of kestrels and other raptors.

The reduction of coniferous cover will adversely affect large mammals. Coniferous habitat provides travel lanes and escape and thermal cover for big game species. Mule deer are seldom far from escape cover. As a result, some of the reclaimed areas may not receive optimum use by mule deer until coniferous habitat becomes reestablished.

One of the habitat changes following reclamation would be the loss of 64 acres of breaks. Breaks were identified in the wildlife study as extremely important to both pronghorn and mule deer during winter and to a lesser extent during early spring prior to snowmelt. Fifty percent of the winter mule deer sightings were within this habitat, however, none of these sightings were within the North King mining unit. The 64 acres not reclaimed to breaks represent only 2 percent of the 3158 acres of breaks within the life-of-mine area (intensive study area) and the two mileperimeter outside the life-of-mine area (extensive study area). The 3158 acres of breaks habitat represents 7 percent of the 48,424 acres of all habitats contained within the intensive and extensive study areas. Therefore this reduction is expected to have a minor effect on wildlife.

The reclamation would reestablish the original acreage of premining habitats; however, the habitats would be in larger blocks than before mining. The result would be a reduction in habitat interspersion and "edges". Edges are areas that provide several varied habitats within a small area, allowing a species to use the habitat more efficiently.

(4) Statement of impacts that would occur to specific species because of mining in the permit area.

(a) The permit area will be fenced and livestock excluded for approximately 18 years. The fence should have a 16 inch gap below the bottom strand to allow antelope passage. According to Douglas Day, Land Manager for Montco, the fence will be so constructed (oral commun., January 17, 1984). Deer will readily jump the fence. As soon as revegetation becomes established, the nutritional content and digestibility of the new growth will most likely exceed that of the undisturbed mature forage. Deer will probably move into the revegetated area, as they have in similar situations at other nearby mines, and therein obtain an improved diet due to lack of competition from cattle and availabiliity of new growth on the plants; however, escape and thermal cover will be lost until replanted pines mature.

There is an annual back-and-forth movement of mule deer between the Custer National Forest and the riparian habitat along the Tongue River, crossing the life-of-mine area and the permit area. This movement may be described as a general drift down ridges and draws. The mining activity would not act as a barrier because the deer could readily bypass the mine.

(b) Pronghorn use as fawning areas the benchlands described in Chapter III. In addition, the bench south of King Creek appears to be an attractive fawning site. The increase in activity and noise may displace animals using these sites.

(c) According to the permit application, several sharp-tailed grouse dancing grounds would lie close to disturbance areas but not be physically altered during the life of the mine. The importance of nesting cover within the mining units was not determined. Nesting cover and wintering habitat in the area to be mined will be destroyed for approximately 5-6 years.

(d) The spring in Section 5 is expected to dry up as a result of mining activity. This may be a serious loss of water for many wildlife species. The loss would be partially mitigated in that the stock pond in Section 9 would be restored and expanded.

(e) Impacts on raptor nesting are not likely. However, there may be one instance of nest desertion by a red-tailed hawk near a soil stockpile in the life-of-mine area (South King mining unit).

(f) Rare, threatened, and endangered species would not be adversely affected by the first 5 years of the mine; however, cliffs that could be used as nesting sites for peregrine falcons will be monitored by Montco for reproductive activity during the spring. If peregrines are sighted, it will be immediately so reported to the Montana Department of State Lands and to the U.S. Fish and Wildlife Service.

(g) An indirect impact that would result from the Montco Mine and additional mines expected to be built in the future stems from the increase in people in the Ashland area. The additional people are expected to increase recreational demands on the national forest and private lands. As a result, both legal and illegal hunter kills are expected to increase.

G. CLIMATE

Climate would not be measurably affected by the proposed mining operation. Particulate and gaseous emissions would be neither sufficient nor emitted at high enough altitude to interfere with atmospheric processes.

H. AIR QUALITY

1. Status of Montco's Air Quality Permits

On April 29, 1982, Montco submitted an application to the Montana Department of Health and Environmental Science, Air Quality Bureau, for an air quality permit. On October 25, 1982, Montco received a preliminary decision from the State that a permit would be issued. The State cannot issue the final permit until 15 days after the final Montana EIS is published.

Montco applied to the EPA in Denver for a nonapplicability determination. (A determination by EPA that prevention of significant deterioration of air quality (PSD) does not apply.) EPA granted a nonapplicability determination on April 12, 1982.

2. Summary of Impacts

During the year of maximum production and surface disturbance, year nine, total suspended particulate (TSP) concentrations in the vicinity of the permit area would increase somewhat over premining levels. The major sources of TSP would be traffic on FAS 566 from Ashland to Montco mine entrance. Air quality deteriorations caused by increased traffic on the county road (FAS 566) would be very localized.

3. Minesite Emissions

Dust emissions from the proposed permit area would consist of overburden, topsoil, and coal particulate. The dust would be emitted primarily during removal and hauling of overburden and wind erosion of disturbed areas. According to the Montana DSL, these would account for 1,254 tons of particulate per year, over 77 percent of total emissions from the proposed permit area (MDSL, 1982d, table III-5). Coal dust emissions would be minor at 116.9 tons per year, or 7.6 percent of total emissions. Topsoil particulate emissions would be insignificant. Gaseous pollutant emissions from blasting and diesel fuel and gasoline combustion would also be insignificant (Montana Department of State Lands, on-file report, 1981).

Coal dust loss from unit trains may or may not be a significant air pollution problem. Although coal loss from unit trains is often estimated at one percent, no substantiation exists for this figure. More research is needed to determine the magnitude of the loss.

The increase in coal dust emissions on the Northern Cheyenne Indian Reservation would be insignificant (SAI, 1981).

The maximum annual TSP concentrations caused by emission sources within the permit area would occur at a point approximately 0.5 miles northeast of the South King mining unit and would be about 45 ug/m^3 (annual geometric mean), equivalent to an annual arithmetic mean of 55 ug/m^3. Coal dust would be an insignificant portion of this increase (SAI, 1981). This would be the "worst case" situation, and would be about 2.5 times greater than premining concentrations. Even so, the effects, if any, on human health, wildlife, and vegetation would probably be insignificant.

4. Emissions from FAS 566

The major source of particulate emissions associated with the mine would be traffic on FAS 566, the gravel road from Ashland to the minesite. Assuming 330 light duty vehicles and ten heavy-duty vehicles (SAI, 1981) make the 11-mile round trip daily, annual particulate emissions would total about 3,350 tons per year (Montana Department of State Lands, on-file report, 1981), compared with 1,620 tons of particulate from all other mining activities. The air quality modeling done by SAI (1981) fails to include the gravel road as a source and therefore substantially underestimates the increase in TSP concentrations. With the gravel road included, the secondary Federal and Montana ambient air quality standards would probably be exceeded outside the proposed permit area boundary.

The TSP concentrations on the Northern Cheyenne Indian Reservation would increase slightly (SAI, 1981) and would not consume the class I increment (table III-15 in this EIS).

5. Health hazards

Exposure to pollutants in the mine would not pose a health hazard to mine employees. The National Institute for Occupational Safety and Health (Fairman and others, 1977) concluded that employment in surface coal mining was not likely to cause the development of either coal worker's pneumoconiosis, "black lungs", or clinically significant respiratory impairment. The National Research Council (1981), upon examinaton of various mortality studies, concluded that exposure to diesel exhaust in surface coal mines does not pose a hazard of lung cancer or other cancers. There may be a hazard of emphysema, but further research is needed.

Both Federal primary and Montana AAQS are now exceeded at one monitoring site in Ashland; air quality would deteriorate further from the increase in vehicle traffic. The average daily count on the gravel road from Ashland to the mine entrance (FAS 566) was 80 in 1976 (Montana Department of Highways, 1976), compared to the 680 that SAI (1981) estimates would occur during mining. This increase in traffic would cause a concomitant localized increase in TSP concentrations; the Federal primary and Montana AAQS standards would thus continue to be exceeded. The TSP concentrations in Ashland would be much greater than those estimated for the actual minesite.

This increase in TSP concentrations along FAS 566 would possibly increase the frequency of lower-respiratory illness among Ashland residents, expecially children (Hammer, 1976). Only those residents living close to FAS 566 would be exposed to the elevated TSP concentrations.

Montco plans to surface that portion of FAS 566 (2.38 miles) adjacent to the permit area which will be relocated to permit mining. This would decrease to some extent the TSP concentrations along FA 566. A further decrease in TSP concentrations could be realized if FAS 566 was paved or treated to reduce dust emissions. Montana's coal severence tax, which is levied to finance mitigations measures for towns and counties impacted by coal mining, could provide moneys for paving or treating FA 566. (See Community Services.)

I. ECONOMIC CONDITIONS

1. Summary of Impacts

Powder River County would experience significant fiscal impacts because it would have to raise its tax rate substantially to pay for expenditures attributable to the Montco mine. Fiscal impacts on Rosebud County would be positive over the life of the mine, although some revenue shortfalls would occur initially. Montco would increase employment in both counties, and would contribute substantial revenues to State and Federal governments.

The ensuing documentation of these conclusions is based on the EIS prepared by the Montana Department of State Lands (MDSL, 1982d). Their analysis has been updated to reflect the later startup date for the Montco mine. The model they used to project employment and fiscal conditions was developed by Mountain West Research, Inc. (MWRI, 1981), and is described in appendix 6 of their EIS.

2. Employment

a. Mine Employment

Construction of the Montco mine is projected to begin in 1985 with 25 construction workers and 20 permanent employees. Construction would peak the following year, with 450 construction and 40 permanent workers. Construction would end and production would begin in 1987 with 350 construction and 130 permanent workers.

Operations employment would increase continuously to 560 jobs in 1999, when the mine would reach full production. Employment would remain at this level until 2004, then decline rapidly to 70 in 2008, the last year of reclamation. Some workers would be retained after this date to reclaim the minesite and dismantle the facilities.

Construction labor for the Montco mine would come from 3 major sources: local residents within commuting distance of the mine (20 percent), nonlocal in-migrants (65 percent), and Northern Cheyenne (15 percent). (See MDSL, 1982d, table III-6.) Operations labor would show a similar pattern, except about 32 workers from the construction work force would also be available. (See MDSL, 1982d, table III-7.)

The residential distribution of the Montco work force would determine, more than any other factor, social and economic impacts. Estimates of residential distributions for both the construction and operations work force are presented in MDSL (1982d), tables III-8 and III-9.

Residential distribution was estimated using the following assumptions: Northern Cheyenne employed by the mine would probably not move from the reservation (NCPO, 1981, p. 15). Other local workers were allocated according to the 1980 population distribution within Montco's labor market area. The

distribution of the nonlocal workers was based on (1) a review of the capability of potential communities to absorb additional population, (2) residential and commuting preferences of mine and construction workers, and (3) transportation system characteristics.

b. Regional Employment

The employment pattern of the region would not be significantly altered by construction of the Montco mine. (See fig. IV-2.) Whether or not the mine is built, regional employment would decline rapidly from 1984 to 1986 as construction of Colstrip units 3 and 4 ended. Between 1985 and 1999, operations employment at Montco would gradually increase to 560, causing total employment (including secondary employment) to rise 5 percent to 12,660. It would remain at that level until Montco mine production dropped off in 2004, when total employment would again begin to decline.

Operation of the mine would add to the region's increasing reliance on coal mining for its economic base. By the end of the century, the mine would raise employment in coal mining to nearly equal that of agriculture.

In the cumulative scenario, in which four new mines would be opened, the dropoff in employment at the close of the Montco mine would not occur. (See fig. IV-2.) Instead, the last mine in the cumulative scenario would replace the jobs lost at Montco. Total employment would rise through a series of construction peaks, reaching a level in 2006 nearly the same as the 1998 peak.

In 2003, employment in the cumulative scenario would temporarily surpass the 1998 peak of 14,600. Unlike in 1998, however, the jobs would be made up of positions in permanent operations, not temporary construction. Even after Montco closed, nearly 2,400 persons would be employed in coal mining--31 percent of the region's basic industry work force. Agriculture and TU (transportation and utilities), each providing 17 percent of the region's basic industry employment, would share second place. Thus, not only would coal mining replace agriculture as the region's single largest employer by 1995, by 2012 it would employ 80 percent more people.

c. Rosebud County Employment

Most of the Montco work force would live in Rosebud County. The changing employment pattern there would be similar to the region's. (See fig. IV-3.)

At its peak, mine construction would create 425 jobs in Rosebud County--64 percent of the total regional increase. This would raise total employment 9 percent above the level expected without the mine.

Operations employment would increase gradually, peaking in 1999. At that time there would be 2.4 times more jobs in mining than in agriculture. The peak total employment effect of the mine would be felt in 2004, when 458 jobs would result. This would represent about 56 percent of the total regional employment increase. Of the jobs created, 111 would be nonmine positions.

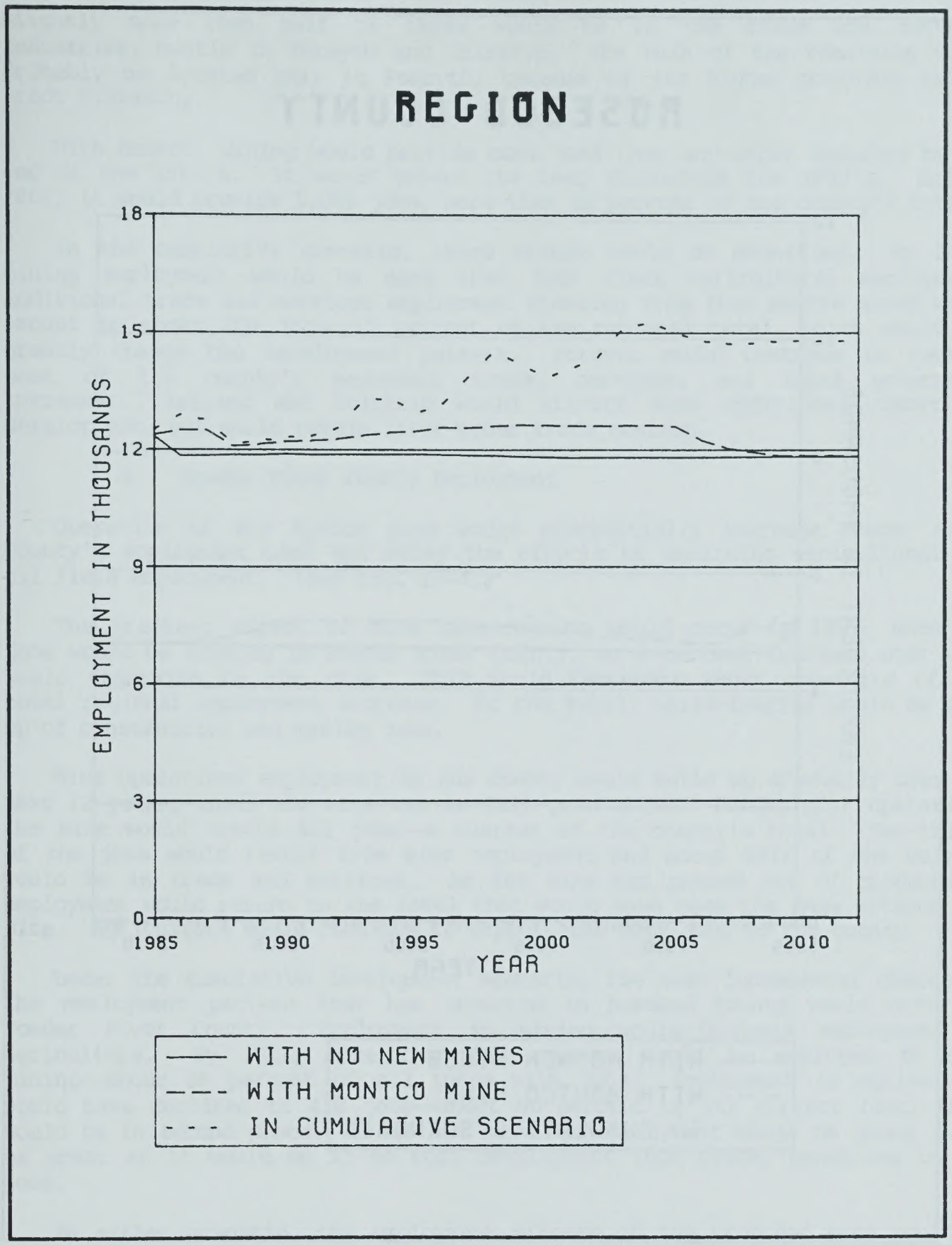

Figure IV-2.--Total employment in the region, 1985-2010.

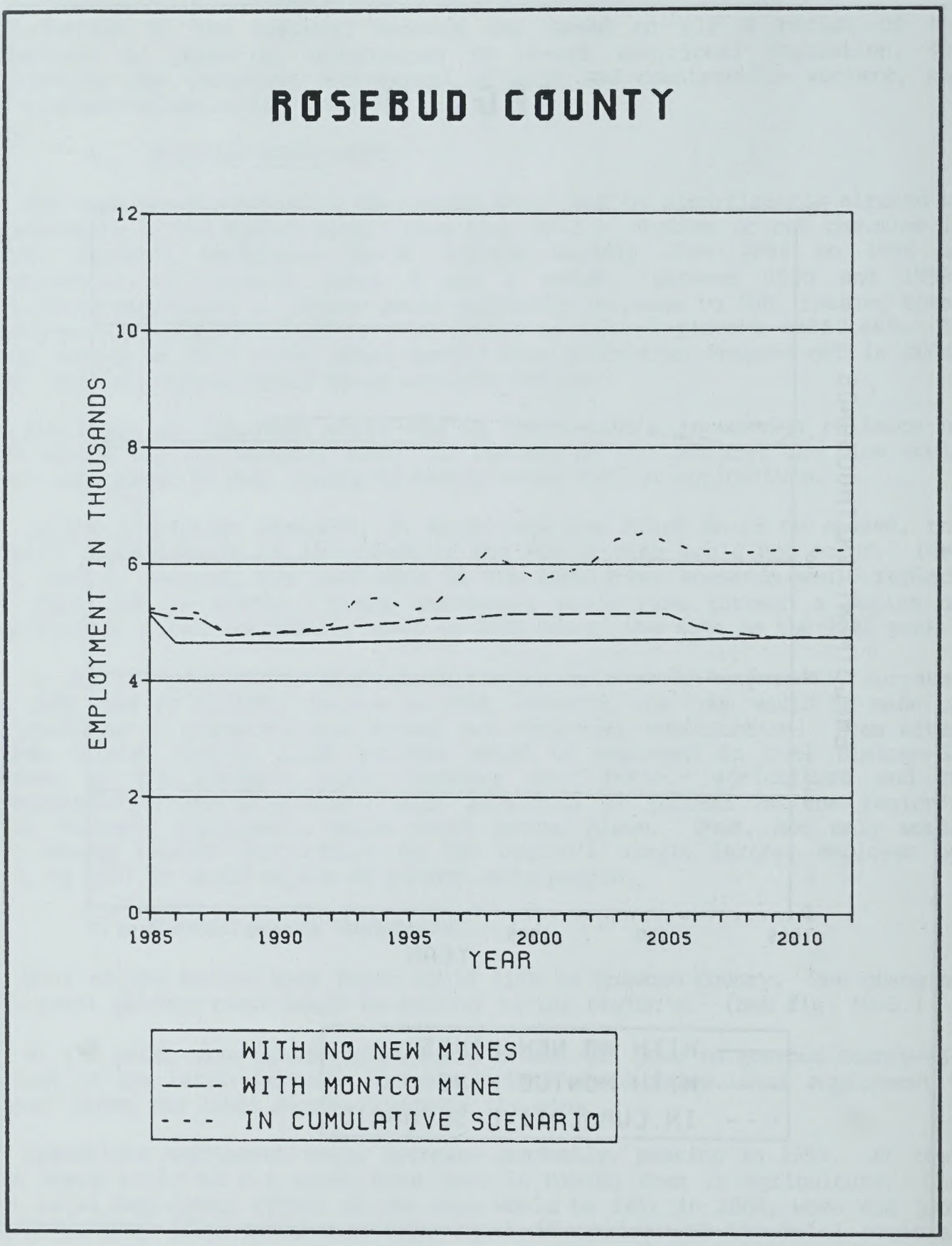

Figure IV-3.--Total employment in Rosebud County, 1985-2010.

Slightly more than half of these would be in the trade and services industries, mostly in Forsyth and Colstrip. The bulk of the remaining would probably be located only in Forsyth, because of its higher position in the trade hierarchy.

With Montco, mining would provide more jobs than any other industry by the end of the 1980's. It would extend its lead throughout the 1990's. And by 2002, it would provide 1,069 jobs, more than 20 percent of the county's total.

In the cumulative scenario, these trends would be magnified. By 2012, mining employment would be more than four times agricultural employment. Additional trade and services employment stemming from four active mines would amount to about 200 jobs--15 percent of the regional total, which would not greatly change the development pattern. Forsyth would continue to receive most of the county's secondary trade, services, and local government increases. Ashland and Colstrip would attract some additional commercial development, but would remain first-order trade centers.

d. Powder River County Employment

Operation of the Montco mine would substantially increase Powder River County's employment base and delay the effects of declining agricultural and oil field employment. (See fig. IV-4.)

The greatest effect of mine construction would occur in 1987, when 217 jobs would be created in Powder River County, an 8 percent increase over what would otherwise be the case. This would represent about one-third of the total regional employment increase. Of the total, three-fourths would be made up of construction and mining jobs.

Mine operations employment in the county would build up gradually over the next 12 years, until the mine was in full production. During peak operation, the mine would create 322 jobs--a quarter of the county's total. Two-thirds of the jobs would result from mine employment and about half of the balance would be in trade and services. As the mine was phased out of production, employment would return to the level that would have been the case without the mine. Agriculture would continue to support the most jobs in the county.

Under the cumulative development scenario, the same fundamental change in the employment pattern that has occurred in Rosebud County would occur in Powder River County. Employment in mining would surpass employment in agriculture. By 2012, more than 500 persons would be employed in coal mining--about 26 percent of all those with jobs. Employment in agriculture would have declined to 410 jobs--about 80 percent of its current level--and would be in second place. Trade and services employment would be about twice as great as it would be if no coal development took place, amounting to 300 jobs.

In either scenario, the employment effects of the proposed mine would be concentrated in the Ashland vicinity of Powder River County and in Broadus. Broadus would receive almost all of the secondary trade and service job development.

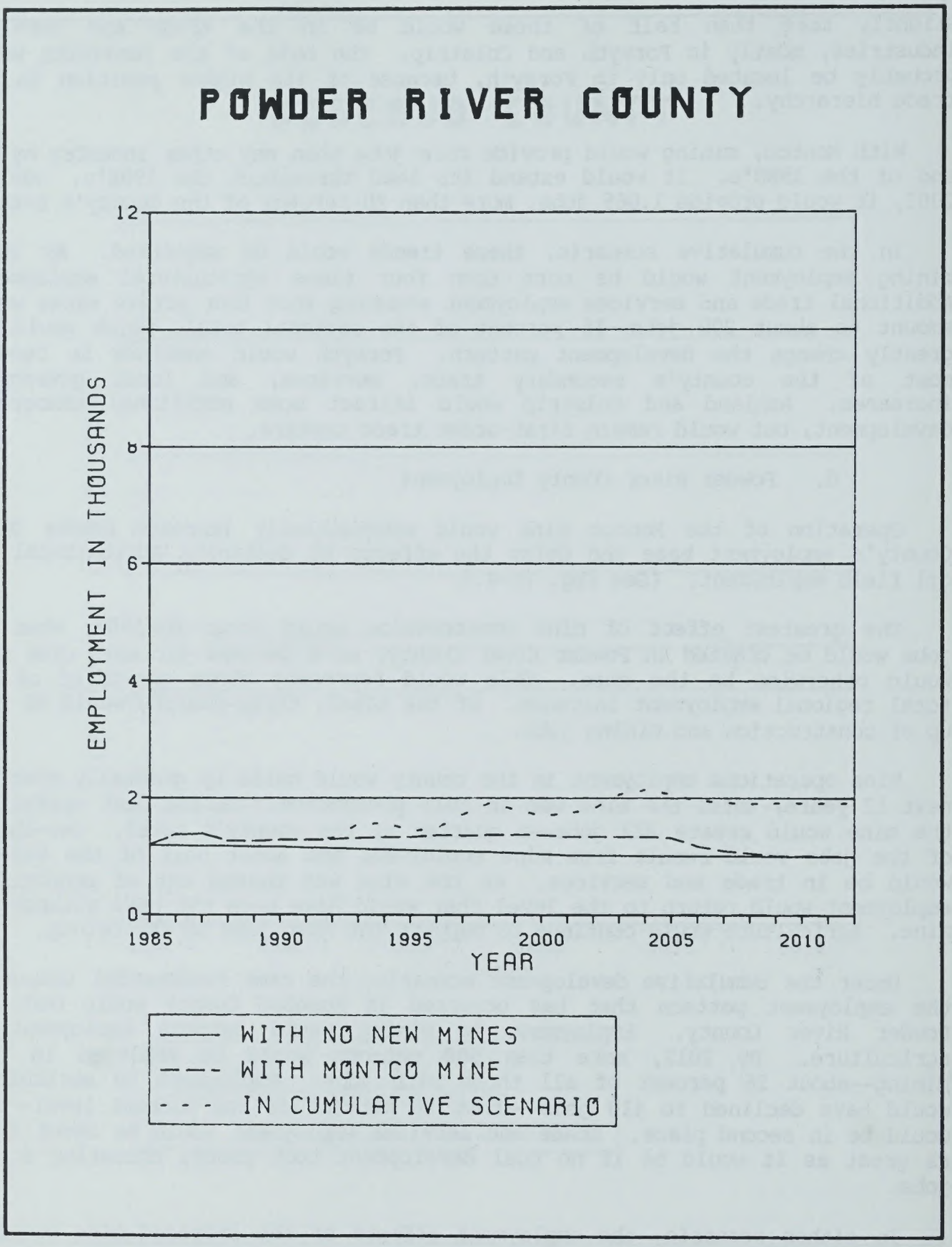

Figure IV-4.--Total employment in Powder River County, 1985-2010.

e. Custer County Employment

Custer County would not be significantly affected by the Montco mine, because none of the miners are expected to settle in the county. (See fig. IV-5.) The greatest employment effect would occur during the full production phase of the mine and would amount to 41 secondary jobs, less than 1 percent of the total county employment. In the cumulative scenario, the effect would be greater, but still small: total employment would increase by 9 percent, mostly from the operation of the proposed Tongue River Railroad. In 2012, when coal shipments would be at the highest level, 261 of the 546 jobs that would be created in Custer County would result from the new railroad.

3. Fiscal Conditions

The State of Montana would receive most of the tax revenue from Montco. Adverse fiscal impacts from the mine would fall on local government and school districts, primarily in Powder River County. Project-generated revenues would not be available to all affected jurisdictions. This would upset the fiscal balance of Powder River County, Broadus, Broadus's schools, Colstrip's schools, and Forsyth. Second, revenues generated would not be available during the years of project-induced expenditures. This would cause net revenue shortages for Rosebud County and the yet-to-be-built Ashland high school.

In the cumulative scenario, these problems would be aggravated. Expanded long-term permanent and peak temporary population influxes would require larger capital outlays, primarily in the late 1980's, several years before any additional tax revenue would be available. Later, however, taxable valuations for most of the jurisdictions affected by the Montco mine would swell. Thus, during the 1990's and beyond, the property taxes would provide all essential funding.

a. State Revenues

Montco would generate State revenues primarily through the coal severance tax, the resource indemnity trust tax, personal income taxes paid by miners, the corporate license tax (a State income tax), property taxes paid into the equalization fund of the State school foundation program, and royalties from State coal.

Assuming a contract sales price of $7.50 per ton (1980 dollars), the mine at full production would pay coal severance taxes of about $27 million per year. Other coal taxes would provide an additional $700,000 per year. Over the life of the mine, these taxes would amount to about $428.3 million. The corporate license tax would peak at about $900,000/year at full production. Over the life of the mine, the State would collect about $14 million.

About 71 million tons of State coal would be mined during the life of the mine (Lanny Icenogle, Montco, oral commun., February 22, 1982). Because current State leases would expire before the coal would be mined, new royalty

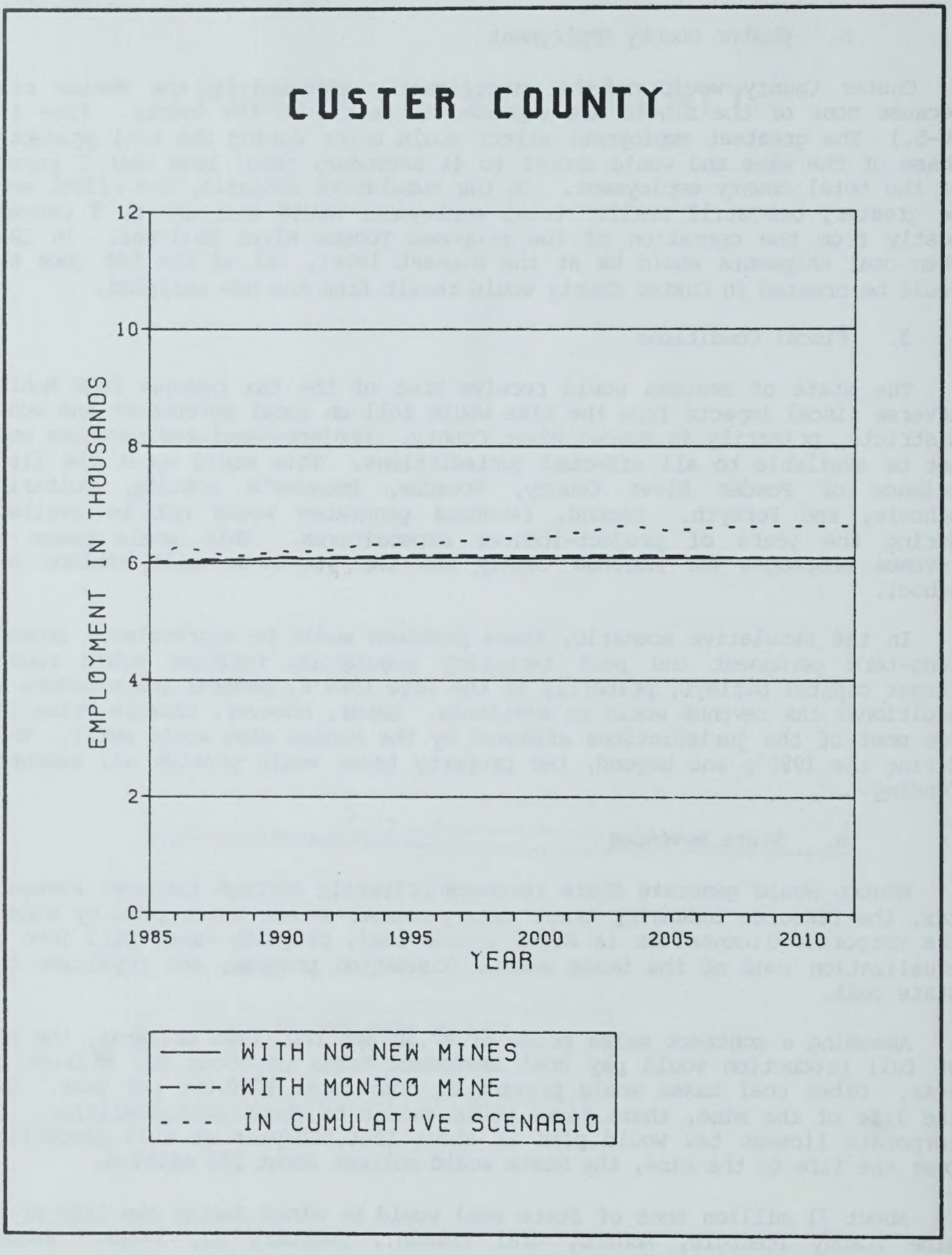

Figure IV-5.--Total employment in Custer County, 1985-2010.

rates would be at least 12.5 percent of the f.o.b. price of the coal, considerably higher than the current rate of 17.5 cents per ton. The royalty rate per ton would be about $1.56 in 1980 dollars, which would produce State royalties of about $111 million over the life of the mine.

Yearly personal income tax receipts from Montco miners would peak in 2005, when the State would collect about $675,000. Over the life of the mine, the State would collect about $10.9 million.

The cumulative development scenario would produce much more revenue. By 2010, coal taxes would total more than $1.1 billion, personal income taxes, about $32.2 million, and the School Foundation Equalization Fund revenues, about $83 million.

b. Rosebud County

For the first five years, the Montco mine would require more expenditures by Rosebud County than the mine would pay in taxes (at the current tax rate). The county would therefore have to raise the property tax rate by perhaps 3 mills--a 20 percent increase over the present amount--to fund an equivalent level of services. Over the life of the mine, however, the additional revenue collected by the county as a result of the proposed mine would surpass the additional cost induced by the mine. The surplus, if accumulated, would amount to $10 million (in 1981 dollars). Since counties are required to operate with a balanced budget, the revenue surpluses would not in fact occur, but rather the tax rate would go down.

The cumulative scenario would produce a similar pattern--revenue shortfalls (i.e. higher tax rates) in the initial years followed by long-run revenue surpluses (i.e. lower tax rates).

Assuming that additional elementary school space will not be needed, no major negative fiscal impacts would occur in the Ashland elementary school district from the Montco mine. (See Community Services.) Increases in the district's taxable valuation would from the beginning greatly surpass the additional expenditures caused by the mine. The cumulative scenario would not produce a significantly different result.

Except for the year that a new high school is assumed to be constructed, the taxable value increases resulting from the proposed mine would easily support the operation of a new Ashland high school district with boundaries similar to the elementary district. The cumulative scenario would not produce a significantly different pattern.

Because Montco would not contribute to the Colstrip school district's taxable value, the costs of the elementary district would exceed revenues attributable to the Montco mine. Even so, these adverse impacts would be insignificant because of substantial additions to the elementary district's tax base by Colstrip generating units 3 and 4. In the cumulative scenario, the fiscal impacts would be greater but still within the capacity of the district to absorb without a significant increase in taxes.

Fiscal impacts on the Colstrip high school, Forsyth schools, and city government would be minimal whether Montco alone is built or the cumulative scenario takes place.

c. Powder River County

Because the proposed Montco mine would only indirectly add to the Powder River County tax base, serious negative fiscal impacts would result. Revenue would fall short for about the first 20 years of the mine. This would exacerbate the projected erosion of the tax base from declining oil production. The net negative fiscal impact of the mine--that is, the cost of providing needed services generated by the mine minus tax revenues from the mine--would amount to about $2.2 million over the life of the mine (MWRI, 1981). Beginning in the early 1990's, the county would need to increase the tax rate by as much as 50 mills (compared to the 1980 rate of about 31 mills), to maintain services. Most of the tax burden would consequently shift to agriculture.

In the cumulative scenario, the revenue shortfalls would not last as long but would still be serious. Increasing coal production would not make up for the declining oil production taxable value until the turn of the century.

The tax base in the town of Broadus would benefit only indirectly from coal development. Broadus would consistently incur revenue shortfalls similar to but smaller than those incurred by Forsyth. Whether Montco alone is built or the cumulative scenario takes place, the Broadus elementary school district would sustain revenue shortfalls. Neither Montco nor the projected mines would directly increase the district's tax base, but all would cause enrollment to increase.

If only Montco were built, revenue shortfalls would also hit the Broadus high school district. In the cumulative scenario, however, coal production would replace oil production as the major source of the district's taxable valuation, allowing the district to manage additional costs.

d. Custer County

Custer County's fiscal outlook would not be significantly affected by the Montco mine.

e. Northern Cheyenne Reservation

Because population would not increase on the reservation from the proposed mine, the tribal government's fiscal outlook would not be significantly affected.

f. Federal Revenues

Montco would generate Federal revenues primarily through the corporate income tax, the black lung excise tax, and the abandoned mine reclamation fee. The corporate income tax would produce about $5.9 million per year at full production and $92.0 million over the life of the mine. The black lung excise tax would be about $0.50/ton, or $6 million per year at full production and $93.0 million over the life of the mine. The abandoned mine reclamation fee would be $0.35 per ton or $4.2 million per year at full production and $65.1 million over the life of the mine. These latter taxes are earmarked for mining-related programs and would not accrue to the Federal general fund.

The cumulative scenario would produce much greater revenue, particularly since the other mines in the scenario would probably produce Federal coal and thus pay Federal royalties. The royalty rate would be $1.56 per ton, half of which would be returned to the State.

J. SOCIAL CONDITIONS

1. Summary of Impacts

Social impacts would be moderately significant in the Ashland area because mine-induced population growth would stress the capability of the community to respond effectively. Ashland would probably adjust to population growth and changes in its social organization after the initial construction of the mine. Social impacts would probably not be significant in other communities and rural areas because they would not grow as fast as Ashland, and because they are better organized to meet growth-related demands. Although some individuals, especially those with long-standing ties to agriculture, would probably find these changes detrimental, the impact on their way of life would probably not be highly disruptive.

The following documentation of these conclusions is based on information in the previous EIS on Montco (Montana Department of State Lands, 1982d) and on additional information provided by Montco and others following publication of that EIS.

2. Population

a. Effects of Montco

The Montco mine would increase the population of Ashland, Birney, Broadus, and Colstrip, and to a lesser extent the town of Forsyth and the rural areas of Rosebud, Powder River, and Custer Counties. Miles City and the Northern Cheyenne Reservation would experience only slight population increases. Population would increase in those communities as new mine employees moved to the area and as secondary employment increased in response to the mine (see Economic Conditions). The mine would cause a fairly sharp increase in the population of Ashland and surrounding areas, Birney, and Broadus during the initial construction phase of the mine (1984-1986). Populations would then

dip slightly as construction workers left. A slow increase during the operation phase (1986 through about 2005) would ensue, followed by a more rapid decline to premining levels from about 2005 to 2010. Population in Colstrip would show a similar, through less pronounced, pattern. Forsyth, Miles City, and the rural areas of the three counties would experience little change as a result of the mine. The Northern Cheyenne Reservation would experience only minor population increases from the mine.

Population increases attributable to the Montco mine would be most pronounced in Ashland and the immediately adjacent rural areas. (See MDSL, 1982d, table III-10.) The Ashland area would reach a maximum population of about 1,400 in the late 1990's--double the current population. (See fig. IV-6.) Essentially all of this increase would be the result of the mine. Annual growth rates would be highest during initial mine construction, perhaps reaching a 50 percent annual increase, but only for about 1 year. Population of the Ashland area would dip slightly following construction, and would then grow slowly (about 5 percent per year, on the average) until the late 1990's. A slow population decline would ensue (1-2 percent per year) until about 2005, when the decline would become faster (10-20 percent per year) until the area returned to its premining population level.

The mine would moderately increase the population of Birney. During construction, about one-fourth of the estimated 140 residents would be attributable to Montco. This proportion, as well as the total population, would gradually increase during mining until about 40 percent of the residents would be attributable to Montco. Birney would have a projected population of about 190 by 2003. As mine operations phased out, Birney's population would decline to near premining levels.

The mine would also moderately increase the population of Broadus, in Powder River County. During mine construction, about one-fourth of Broadus's population--about 180 people--would be attributable to the mine. During operation, as much as one-third of the population would be attributable to the mine. The total population would reach a peak of about 980 by about 2000. Annual growth rates in Broadus would be as high as 20 percent during construction, moderating considerably during mine operation.

The mine would have a relatively small effect on the population of Colstrip, because fewer Montco workers would live there than in Ashland, and because Colstrip's population is larger. (See fig. IV-7.) Further, the initial increase attributable to Montco would overlap somewhat the decline in Colstrip's population from the completion of generating units 3 and 4, which would make the decrease less sharp. Montco-related population would represent at most 13 percent of Colstrip's population. Once Montco construction workers who lived in Colstrip left (by about 1989), the town's population would remain virtually unchanged through the projected life of the mine--as it would without the mine, but at a slightly lower population.

The mine would increase the population of Forsyth by about 5 percent over the expected population without the mine, owing almost entirely to indirect employment. The mine would have a negligible effect on growth rates in Forsyth.

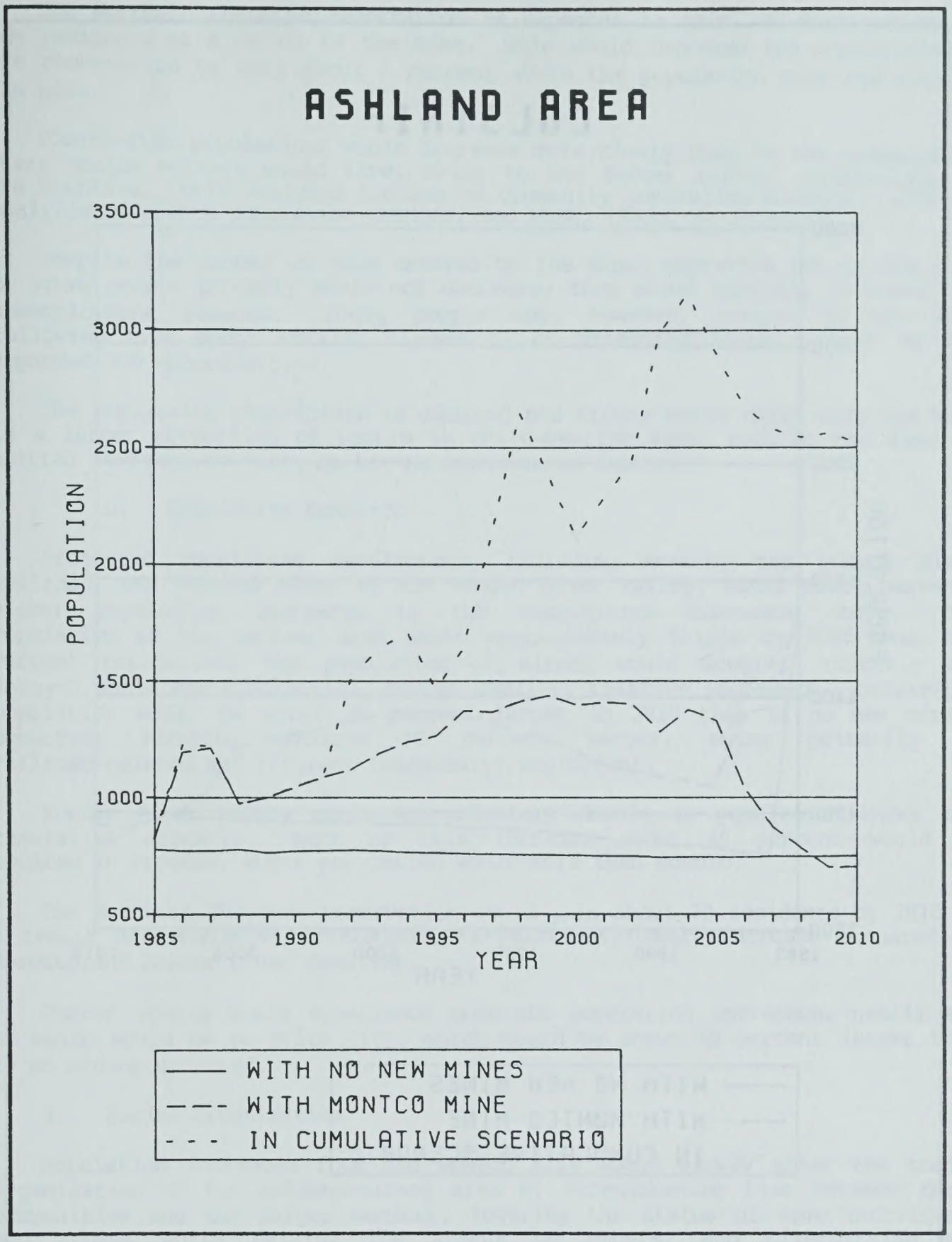

Figure IV-6.--Projected population of Ashland area--baseline (no new mines), with Montco mine, and cumulative scenarios.

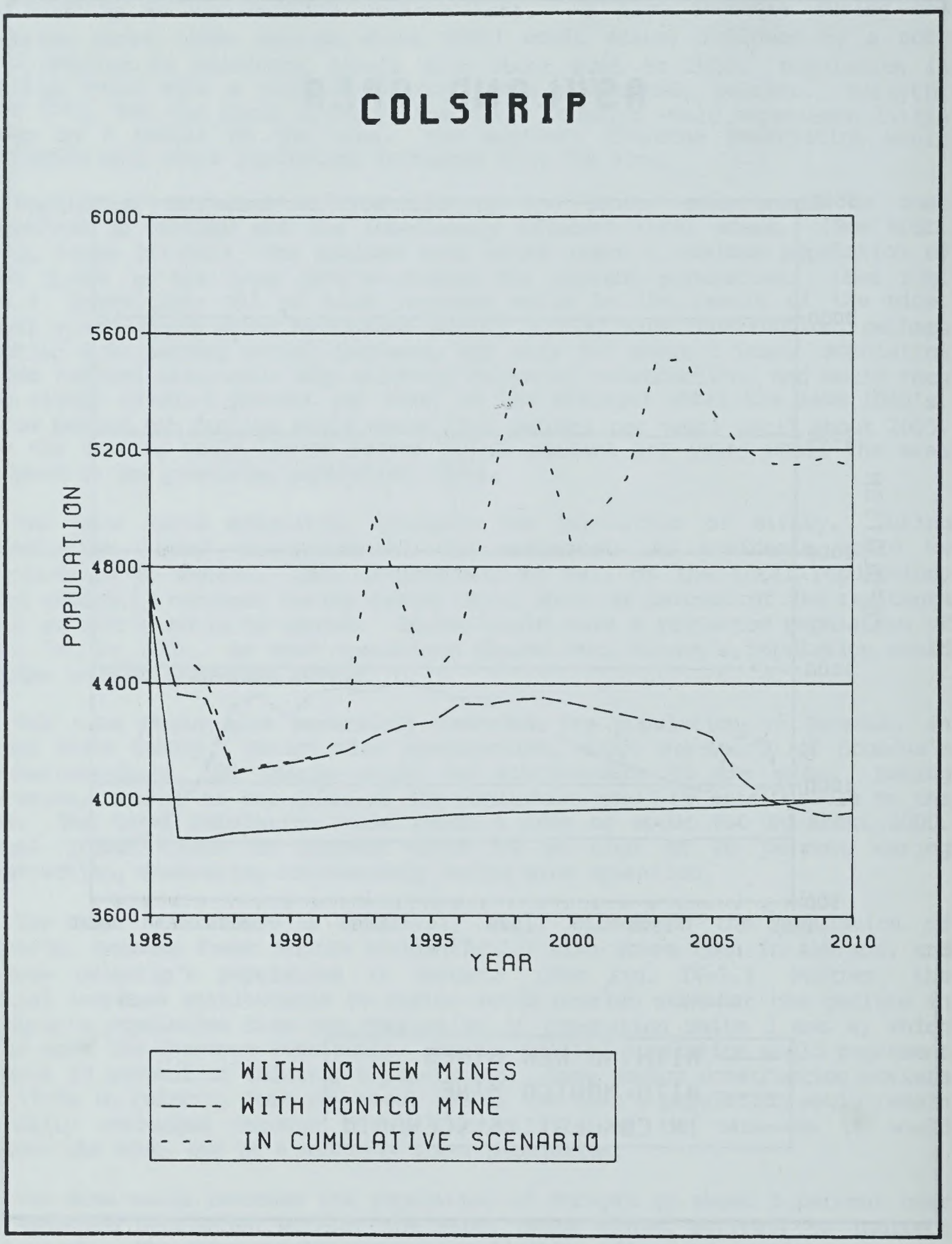

Figure IV-7.--Projected population of Colstrip--baseline (no new mines), with Montco mine, and cumulative scenarios.

The Northern Cheyenne Reservation is expected to gain, at most, about 30 new residents as a result of the mine. This would increase the population of the reservation by only about 1 percent above the population expected without the mine.

County-wide populations would increase more slowly than in the communities where Montco workers would live, owing to the larger initial populations of the counties. This analysis focuses on community population changes. (For an analysis of county population changes, see MDSL, 1982d, p. III-52.)

Despite the number of jobs created by the mine, migration out of the area by young people probably would not decrease; they would continue to leave for nonemployment reasons. Young people may, however, return to the area following time spent working elsewhere, or attending school, drawn by the expanded job opportunities.

The population composition of Ashland and Birney would shift with the mine to a larger proportion of people in child-bearing ages, causing the rate of natural increase to rise, as births outnumbered deaths.

b. Cumulative Scenario

Projected cumulative development, including Montco, the Tongue River Railroad, and related mines in the Tongue River valley, would cause markedly higher population increases in the communities discussed above. The population of the Ashland area would approximately triple by 2005 over the current population; the population of Birney would double. Colstrip and Forsyth would see substantial, though smaller, relative increases. Colstrip's population would be about 28 percent larger in 2010 than if no new mining occurred; Forsyth, perhaps 20 percent larger, owing primarily to railroad-related and indirect (secondary) employment.

Powder River County could approximately double in population under the cumulative scenario. Much of this increase--about 40 percent--would be located in Broadus, where population would more than double.

The Northern Cheyenne Reservation would gain about 70 residents by 2010 as a result of cumulative development, a relatively small increase compared to Rosebud and Powder River Counties.

Custer County would experience moderate population increases, nearly all of which would be in Miles City, which would be about 10 percent larger than if no mining occurred.

3. Social Organization

Population increases from the Montco mine would slowly alter the social organization of the Ashland-Birney area by strengthening ties between those communities and the larger society, lowering the status of some individuals and groups while raising the status of others, and diversifying the

occupational structure and introducing new social values. The political process is likely to become more formal. The larger number of groups in the communities is not likely to reach the consensus necessary to respond effectively to the demands of growth induced by the mine. Elsewhere in the region, population increases would not be so great as to cause noticeable changes in social organization.

Coal development would strengthen ties between the Ashland-Birney area and the larger society. Some of these ties would be with government: provision of basic services for increased population would require more interaction between the Ashland area and Rosebud County. More interaction with State and Federal regulatory agencies would be required. Other ties could be with Montco itself: as the communities expanded, they might seek assistance from the company to meet the demands of growth. The strengthening of these ties would tend to remove economic power from the community by increasing the larger society's importance in local affairs. Land use and employment decisions would be increasingly made outside the local area.

Coal development would decrease the relative economic importance of agriculture in the mine area. This would lower the status of some individuals and groups while raising the status of others (Kristi Branch, MWRI, oral commun., 1982.) Ranchers in Rosebud County have already lost some of their former influence as large-scale coal development has made mining and power generation more important in the county's economy. Currently in the Ashland-Birney area, length of family history, business ownership, and size of land holdings are the major determinants of social esteem. With the Montco mine, economic position (income and wealth) could become more important.

Approximately 168 local people would be expected to work at the mine, including 84 Northern Cheyenne. (See MDSL, 1982d, table III-7.) All would probably improve their economic status, particularly the Northern Cheyenne, whose income as a group is low. Some local businessmen would also improve their position through increased trade; they would become less dependent on the Northern Cheyenne for their livelihood. Landowners who have leased their coal to Montco would improve their economic position.

On the other hand, the relative economic status of those who did not benefit financially from the mine would decrease. The average yearly salary of the Montco mine workers would be about $30,000. These workers and their families would have more money than many locals, half of whom made less than $24,000 in 1980. Mine development would increase the number and types of jobs available to locals. Newcomers would compete for these jobs as well as for existing jobs. Montco has no hiring policy now that would give preference to any group.

The number and type of jobs available to women would increase, although the pay scale for jobs such as waitress and clerk would probably remain the same. New jobs in mining would provide an opportunity for women to earn better wages than typically available in rural areas. A few women interviewed in the Ashland-Birney area said they would likely apply for a job at the mine

(MDSL, 1982c). Few women are likely to be employed directly by Montco because few women belong to the mining and construction unions (BLM, 1980, p. 149). This increase in the number of roles open to women would be viewed as an advantage by some women. But changing roles and lifestyles could cause stress for others (BLM, 1980, p. 149).

The Ashland community structure would not respond well to a large population influx and would have trouble controlling the town's growth, because consensus is difficult to reach between the groups in the community. In Birney, the influx would probably not alter the decisionmaking structure as much, because the community is more cohesive. Newcomers with organizational experience who became involved in the local political system would help the community accomodate growth.

In the Ashland area, newcomers would probably garner political strength and outvote long-time residents. Because Ashland is already fragmented, an organized group of newcomers could easily redirect the town's actions. The political structure of Birney, on the other hand, would probably not change much because few mine workers would live in the community, and because the current residents, though split over the coal development issue, still form a cohesive community. Energy development could give these communities more influence in county and State government, thereby increasing the status of some locals (Kristi Branch, MWRI, oral commun., March 1982).

At first, mine employees new to the area would be viewed by many as transient, but would gain respect slowly as they indicated a commitment to the local area, such as by purchasing a home or joining in community activities. Locals might prefer traditional roles and lifestyles; newcomers might demand new and different services, such as day care, found in their former communities. These differences might slow the mixing of, and cooperation between, locals and newcomers (BLM, 1980, p. 150). Newcomers that settled in Ashland or Birney might choose to become part of the existing community or challenge the way the community operates now. Such a challenge would create conflict beteen newcomers and locals. If these positions of authority were filled by new people, decisionmaking would probably become more formal, because newcomers would not be familiar with community members and the current system.

As a result of shifting and inconsistent status within the community, individuals might experience stress. For example, an individual might maintain a position of prestige based on family history and economic position, but lose influence in local decisionmaking to a new, powerful group in the community. Stress might also result between people, as their status relative to one another changed.

An indirect effect of mine development would be a feeling of loss of privacy to local residents, caused by more traffic on county roads.

The occupations, social values, and political processes in the Ashland and Birney communities would diversify as the population grew. The diversity of occupations in Ashland and Birney would expand as new jobs were created in the mining sector. New values, interests, and practices would be introduced to the communities. Most affected by the widened range of values might be young people that formed their values during population influx (Freudenberg, 1979).

Adolescents might have a difficult time adjusting to a growing community. Reported rates of disorders such as child abuse have often been found to rise in a community following a rapid increase in population, perhaps owing to increased stress. This may in part stem from more accurate record keeping or from a high proportion of parents in the child rearing ages in the populations studied. Some studies have cited increased divorce rates from energy-related growth; others have found no substantiation for the claim (Thompson and others, 1980). An increase in the divorce rate could result from a change in the age structure of the area's population, resulting in a greater proportion of people in the ages that are more likely to divorce.

4. Northern Cheyenne Reservation

The Northern Cheyenne Reservation would gain about 30 persons because of the Montco mine. Although this would be a relatively small increase, it may be perceived by the Northern Cheyenne as important owing to potential cultural difference with the newcomers.

The majority of employed Northern Cheyenne now work for the government (NCPO, 1981). The Montco mine would employ as many as 84 Northern Cheyenne (see Economic Conditions). This would expand the importance of mining to the Northern Cheyenne economy, strengthen ties between the Northern Cheyenne and private business, and facilitate the Northern Cheyenne's assimilation into the mainstream of American society (BLM, 1980, p. 145). Assimilation, however, may be unwanted. Even if they were absorbed into non-Indian society, the costs to the Indian people might be great. Cultural change would mean an increasingly stressful life (BLM, 1980).

The Northern Cheyenne are concerned about potential conflict among themselves and with non-Indians. Such conflict could arise from the changing values and lifestyles of those Northern Cheyenne employed at the mine, who would have daily contact with non-Indian society. These mine employees would make more money than most other Northern Cheyenne and thus would be able to buy more goods and services. They might also gain influence in tribal politics and therefore influence the Northern Cheyenne's tribal position on coal development within the reservation.

The money earned at the mine by the Northern Cheyenne would bring increased reliance on a cash economy and increased exposure to other values. This could indirectly decrease the incidence of communal living, resulting in the conveyance of Cheyenne customs and language becoming more difficult. The practice of families and their relatives living together aids the transfer of traditions and Cheyenne knowledge. In particular, the Northern Cheyenne are

concerned that abrupt changes brought about by the Montco mine could destroy the sense of family and community cohesion that has maintained the Birney district as traditionally Cheyenne (NCPO, 1981a). Increased contact could result in more intermarriage. This, in turn, might hasten the eventual loss of the Northern Cheyenne as a culturally distinct people (NCPO, 1981b).

Additional concerns of the Northern Cheyenne are discussed in this chapter under Cultural Resources and Recreation.

The magnitude of these effects on the Northern Cheyenne is not known. Little research has focused on the changes communities undergo as a result of energy development and the specific response of the Northern Cheyenne would be heavily influenced by their culture (BLM, 1980, p. 144). Any negative impacts would worsen with cumulative development.

5. Public Safety and Health

The Montco mine would not cause significant adverse impacts on public safety and health, in that it would probably not create safety or health hazards in excess of those expected by construction or operation of a modern large surface mine. Workers at the mine would be subject to some risk of injury from operation of machinery, and some increased risk of respiratory problems, primarily from suspended particulate. The risk would not be great because Montco would have to comply with all applicable Federal and State safety, health, and air quality requirements, which are designed specifically to protect the health of workers and the public. (See also Air Quality.)

The Montco mine could be expected to have a safety record comparable to that of other Montana surface coal mines. On that basis, perhaps one or two fatal accidents could be expected among the work force over the 24-year life of the mine, although the statistical sample on which this estimate is based (U.S. Department of Labor, 1981, table 6, p. 39) is too small for a reliable estimate. Total injury-causing accidents, including minor accidents not resulting in lost time, are estimated at 330 over the life of the mine, based on Mine Safety and Health Administration statistics (U.S. Department of Labor, 1981, Table 6, p. 39).

The public would be subjected to some increased hazard from road and rail traffic associated with the mine. About 80 traffic accidents are projected to occur as a result of the mine and railroad over their operating lifetimes. These accidents would result in about 40 injuries and perhaps 1 death. These estimates are based on current Montana traffic accident rates on similar roads and on projected increased traffic volumes attributable to the mine (Tom Coefield, MDSL, oral commun., January 13, 1984). This impact could be mitigated by enforcement of traffic safety laws, particularly speed and driving-while-intoxicated laws, violations of which contribute to a major share of accidents in rural areas. (See Community Services).

Workers traveling to the mine, and some residents in low-lying areas along the Tongue River, would be subject to a very small hazard from flooding if the Tongue River Reservoir (which is 40 miles upstream from the minesite) failed. The Montana Department of Natural Resources and Conservation (1982) has developed an emergency evacuation plan which should be sufficient to alert people along the flood corridor in time to escape. The mine and railroad loop would not appreciably increase the height of a flood (see Hydrology).

6. Mitigating Measures

Montco or the local communities could take a number of steps to alleviate social impacts from the mine, but OSM could not require them to do so. It is not clear whether the Montana Department of State Lands could require such measures. For additional mitigating measures that would alleviate social impacts, see Community Services.

OSM could fund research on the social impacts of mining in rural areas, in order to update and extend the work done by researchers starting in the 1970's. This would allow more reliable prediction of impacts for future mines such as those that might be developed under the cumulative scenario. A possible approach would be to examine the reliability of forecasting models used in the past to see which of the predicted impacts, if any, actually occurred.

The sudden population influx from the mine could be reduced if Montco hired local people to work at the mine. Training programs at the mine or on the Northern Cheyenne Reservation would increase the number of qualified local workers.

If Montco provided commuter busing for workers living at Colstrip, it would reduce cross-cultural contact between the Northern Cheyenne and non-Indians, which would help prevent the erosion of their traditional way of life. It would also limit traffic increases on rural roads, which some current residents cite as a concern.

If Montco held public meetings explaining their mine operations, it would help reduce local concern based on uncertainty about the mine.

Integration of newcomers into the local community could be aided if regular community gatherings were held, perhaps by business or service clubs.

K. COMMUNITY SERVICES

1. Summary

Population increases from the Montco mine would adversely affect services and facilities in Powder River County, and to a lesser extent in Rosebud County. The impact would be of fairly low significance, however, because it could be alleviated by Montana Coal Board grants, increased taxes, and advance planning.

In this section, the impacts discussed refer to the strain on services and facilities above that expected if no new mines were developed. (See Chapter III, Community Services.) Most of this section is based on the previous EIS on the Montco mine (MDSL, 1982d), which in turn was based on a report by Mountain West Research, Inc. (MWRI, 1981).

2. Rosebud County

a. Public Safety

Two additional police officers would be needed in 1986 and 1987. In the cumulative scenario this figure would rise to six by 2009. If properly distributed as part of a county-wide patrol plan, these additional officers would allow the county to meet patrol needs in nonincorporated areas.

b. Health Services

One additional physician would be needed over the life of the Montco mine. The county already needs seven additional physicians to meet existing needs. Under the cumulative scenario, two or three additional physicians would be required after 1997.

Four new hospital beds would be needed during mine construction; operation of the mine would not further increase hospital bed demand. Cumulative development, however, would require 7 to 14 additional beds between 1993 and 2009--a 50 percent increase above the existing level.

Montco would create a need for two emergency medical technicians, one ambulance, one public health nurse, one sanitarian, and 300 square feet of space for public health nurses, all during mine construction. The need for these facilities and personnel would fluctuate through 2012, but would not exceed the requirements during the construction years.

Cumulative development would substantially increase requirements for physicians, dentists, hospital beds, emergency medical technicians, ambulances, and public health nurses.

c. Facilities and Services

After 2003, 3 acres would need to be added annually to the solid waste disposal site. No other public works facilities would be affected substantially by Montco. Under the cumulative scenario, however, the county shop would eventually require 8 more persons and 5,600 square feet of space.

An additional 500 square feet of library space would be needed to accommodate use generated by Montco. In the cumulative scenario, three additional library staff members and an additional 1,900 square feet of library space would be needed.

d. Social Welfare

Neither Montco nor the mines in the cumulative scenario would contribute substantially to demand for welfare services. The projected shortage of welfare workers would be almost equal regardless of mine development.

3. Ashland and Birney

a. Housing

The Ashland area would face large housing shortages during mine construction. In 1986, 62 new housing units would be needed to house Montco-related population--30 percent more than what would be expected in the absence of the mine. By 1998, housing demand would decrease to 28 additional units, then climb to a peak of 84 additional units by 1999. Demand would then fall through 2012.

The cumulative scenario would raise housing demand by 1993 to 70 units above the demand created by Montco. Housing demand would fluctuate with this development through 2010. By 2004, demand would reach a peak of 287 units--140 percent above the demand created by Montco alone.

The Ashland area's response to this need would be determined primarily by the availability of construction contractors and financing. Ample land would be available because a major landowner in the area is developing a subdivision south of Ashland. The community would grow to the south or east, because the Tongue River floodplain and the Northern Cheyenne Reservation block growth in other directions.

Housing demand in Birney from Montco would be small compared to Ashland. About 13 new housing units would be needed in the Birney area by 1999. Cumulative development would increase this demand another nine units. Birney's ability to meet this demand would depend on the willingness of a few local landowners to develop their land and the willingness of builders to pass up larger projects elsewhere.

b. Public works

Although Ashland's water demand would rise with development of the mine, the increase would not exceed existing capacity. In the cumulative scenario, however, demand would exceed capacity by 1997, requiring a long-term 27,000-gallon increase over existing supply.

The existing sanitary sewer system and the 12-acre lagoon would handle all projected sewage demand from Montco. In the cumulative scenario, however, the lagoon would temporarily need another acre in 1998 and two more in 2003.

c. Education

Three more teachers (above the current 11) would be needed in the Ashland elementary school between 1994 and 1998. Enrollment would then decline until 2012, when a total of only five teachers would be needed. In the cumulative scenario, a total of 21 teachers would be needed beginning in 1992.

The Ashland Elementary School has adequate space for the additional students from Montco; however, this space may not be designed appropriately for this number of students, according to State standards. In addition, the ratio of space per student may not be adequate by local standards. Additional facilities may be needed.

In Birney, about 600 additional square feet would need to be added to the elementary school to meet construction-related demand induced by Montco. After construction ended, falling enrollment would cause space needs to drop below existing capacity. Cumulative scenario development, in contrast, would require one more teacher at the elementary school beginning in 1993 and a permanent addition of 1,000 square feet to the school building. This expansion could change the character of the school, now staffed by only one teacher.

It is assumed for this analysis that a high school would be built in Ashland to meet the needs of the area's population even without the Montco mine. In addition, temporary classrooms would probably be necessary between 1992 and 2005 to accommodate the 40 students the mine would add to the high school enrollment. Two more teachers would be needed.

In the cumulative scenario, mine development would require similar staffing and space until 1993. Then four more permanent teachers would be needed, as well as one temporary teacher for peak demand in 2003 and 2004. This would raise the total permanent number of teachers to nine.

If a high school is not built, students would have to be bused to other high schools in either Colstrip, Broadus, or Sheridan, Wyoming. This would require another bus as well as adequate facilities and manpower at those schools.

4. Colstrip

Housing demand in Colstrip spurred by Montco mine development would begin in 1985 and peak in 1986 at 162 additional units. Demand would fall slightly in the late 1980's, rise until 1999, then begin to decline. The added demand would dissipate by 2010.

In the cumulative scenario, mine development would have a much greater impact. Housing demand would peak temporarily in 1986 at 208 additional units, then fall to 67 by 1988. As more mines were constructed, demand would rise rapidly to 495 additional units by 1998 and remain in the 300-500 range through 2010.

Colstrip may be able to supply the needed housing. In 1982, construction on Colstrip Units 3 and 4 pushed housing demand to a peak of 2,371 units. The Montana Power Company provided housing units or mobile home pads for most of this demand. Cumulative development would increase demand to 2,383 units in 1983, but thereafter demand would not approach the 1982 peak again through 2010.

Colstrip's ability to respond to this demand would be complicated by two factors. First, many two-family lots are scheduled for conversion to single-family lots once generating units 3 and 4 are completed. Second, the long-term availability of these units is highly uncertain because of the high cost of construction in Colstrip.

5. Forsyth

a. Housing

Montco mine development would push demand for housing units to a temporary peak of 43 in 1986 and 47 in 1987. Demand would peak again by 1996 at 57 units, then decline to 6 by 2012. Demand in the cumulative scenario would follow a similar pattern: it would peak temporarily at 62 additional units in 1986 and 105 in 1994. Then it would decrease slightly for 2 years, followed by a climb to 247 units by 2010.

The Forsyth area's capacity to respond to this would depend on its response to the peak demand caused by construction of Colstrip units 3 and 4. Since the town met the demand in 1982, it would probably be capable of meeting the demand of the Montco mine. Whether it could meet demand in the cumulative scenario would depend on the local construction industry and Forsyth's willingness and capacity to expand its residential areas. Cumulative scenario demand would be 10 percent above the peak that would occur in 1985 if no new mines were built.

b. Facilities and Services

Montco mine development would not necessitate additional government staff above the nine that population-based standards suggest. Forsyth officials, in fact, consider the present staff of seven to be adequate. In the cumulative scenario, government would require 11 persons, according to population-based standards.

Development of the Montco mine would require approximately 85,000 gallons of storage capacity in 1998 above the amount needed if no new mines were built. Water storage capacity requirements with cumulative development would reach 1,833,000 gallons by 2011, 359,000 gallons more than the level required if no new mines were built.

The secondary employment effects and spillover population from the Colstrip and Montco construction work forces would increase demand for teaching staff by one or two teachers. In the cumulative scenario, four or five more teachers would be needed through 2010.

6. Powder River County

a. Public Safety

Two more police officers would be needed from 1986 through 2012 to meet demands induced by Montco. In the cumulative scenario, eight additional officers would be needed. The distribution of patrol cars throughout the county would be as important as the staffing level.

b. Health and Welfare

Powder River county needs another physician regardless of Montco. In the cumulative scenario, a total of three physicians would be needed by 1993, as well as a fourth one-year temporary physician in 2003. One additional dentist would also be needed in 1993. Ambulance services would need to be improved whether the Montco mine alone is built or the cumulative scenario occurs.

As in Rosebud County, the cutback of Federally funded physician recruitment incentive programs may seriously jeopardize the county's ability to recruit and maintain necessary medical manpower.

c. Social Welfare

The part-time social worker now serving Powder River County may need to work full time beginning in 1985 or 1986 to meet increased demand from Montco.

7. Broadus

a. Housing

Fifty-two additional housing units would be needed in Broadus in 1987 whether Montco alone is built or the cumulative scenario occurs. This demand would halve the next year when Montco construction slowed. It would increase to 95 by 2004--28 percent above demand without Montco--then would decline to 14 in 2012.

In the cumulative scenario, this figure would peak at 300 in 2003--87 percent above the demand without any new mines, and 61 percent above the number of units required as a result of Montco.

Broadus's ability to respond to this demand would probably be restricted only by the availability of construction contractors and financing. Land availability would not be a problem: although a floodplain restriction and high real estate prices may have hampered past growth, the town now has plans for expansion to the north and west.

b. Facilities and Services

The Broadus administrative staff would need to be increased from two to three persons in 1986 whether the Montco mine alone is built or the cumulative scenario takes place. With Montco alone this need would drop to two persons by 2006. In the cumulative scenario four persons, as well as additional office space to accommodate them, would be required by 2010.

Broadus's existing water supply could easily accommodate the demand Montco mine development would add. Water storage, however, would be inadequate from 1986 through 2010; demand would temporarily peak at 73,000 gallons above the existing level in 1989. In the cumulative scenario, water supply would fall short by 2003: long-term demand calls for 15,000 gallons of supply above the existing level. Moreover, water storage capacity would require additional capacity through 2010, peaking at 348,000 gallons in 2006.

Adequate shop space exists to handle additional demand attributable to either the Montco mine or cumulative scenario development. The capacity of shop staff, however, would be exceeded. To alleviate this, one additional person would be required temporarily in 1985, and a second between 1994 and 2004, if the Montco mine alone is built. In the cumulative scenario, four additional persons, totaling seven, would be needed by 2010.

8. Ashland Vicinity of Powder River County

Montco mine development would increase housing demand to a temporary peak of 74 additional units in 1987, a 69 percent increase above demand without any development. Demand would grow to another peak of 134 additional units in 2004, then drop by 2009--when Montco ended--to the same level expected without any mine development.

In the cumulative scenario demand would grow with slight fluctuations. By 2010, demand would increase 396 units over the number that would be needed with the Montco mine alone. This demand would be about four times the demand expected without any new mines.

Landowners in the part of Powder River County near Ashland have indicated their desire to subdivide land, and they are supported by their County Commissioners, who usually approve rural subdivisions. The area's ability to respond to housing demand, however, could be hindered by the lack of construction contractors and financing. The lack of centralized sewer and water facilities in the area might also pose a problem for dense housing development. Sparsely-settled residential subdivisions could rely on septic tanks and individual wells.

9. Northern Cheyenne Reservation

Many community services, such as housing, water supply, and community waste disposal systems on the Northern Cheyenne Reservation are not expected to be impacted since little mine-induced population increase is projected for the reservation. Only those services tied to increased commuter or recreational traffic are likely to be impacted, such as law enforcement and perhaps some health services and social services.

Additional law enforcement requirements are likely to strain an already inadequately staffed tribal police force. Increased enforcement demands are most likely to involve traffic violations, motor vehicle accidents, and recreational resources.

Some increase in motor vehicle accident rates will place a slight burden on the clinic and the ambulance service. These services appear to be adequate for absorbing additional clients.

10. Mitigating Measures

Impacts on community services would be alleviated if Montco or the local communities built housing and other needed facilities in anticipation of demand. OSM does not have the authority to require these measures. It is unclear whether the Montana Department of State Lands has the authority to require these measures.

Montco could provide information and technical assistance to local governments and private developers about housing needs, which would help them provide housing for mine workers. Montco could also provide direct loans to employees, loan guarantees, or other financial assistance to help its employees find suitable housing, or it could build and operate temporary housing and camps, but the company has not indicated an intention of doing so.

A more likely source of funding for needed planning, facilities, and services is the Montana Coal Board. The Coal Board is funded through Montana coal severance tax collections. Local governments and service districts may apply to the Coal Board for planning or development grants to fund such projects as water and other facilities, schools, law enforcement, fire protection, roads, and other services and facilities. Grants are made on the basis of need, the severity of impacts, availability of funds, and the degree to which the local government has attempted to secure funds from other sources, such as taxation (Montana Department of Commerce, undated pamphlet published by Montana Coal Board). The Montana Office of Budget and Program Planning projects that over $10 million will be available to local impact areas in fiscal year 1985. The Coal Board has funded a variety of projects in Rosebud County, including school, fire department, and sewer improvements in Ashland. Tribal governments, including the Northern Cheyenne, became eligible for Coal Board grants in October 1983 (Murdo Campbell, Montana Coal Board, oral communication, January 12, 1984). The Montana Department of Commerce, Community Planning Division, offers technical assistance to grant applicants.

Barring unforeseen changes in coal severance tax collections or in its distribution formula, sufficient money would probably be available to local governments in areas impacted by the Montco mine to finance those services and facilities that are most strained by mine development. A major factor will be the degree to which local governments and citizens organize to make grant applications. Rosebud County has considerable experience dealing with coal impacts and with Coal Board applications, but local expertise and leadership appears to be more in Forsyth and Colstrip. If Ashland area residents took advantage of existing expertise and planning assistance, they could probably make the necessary applications in time to mitigate the more serious impacts.

Impacts on community services and facilities would be most likely to occur during the first few years of mine construction, when relatively large numbers of construction workers and the initial operations workers arrived. The

Ashland area, in particular, might not organize sufficiently to make successful grant applications during initial development period, owing to the difficulty of forecasting impacts, its lack of prior experience with coal mining, the absence of a centralized local government (Ashland is unincorporated), and the lack of community cohesiveness. (See chapter III, Social Conditions). Efforts by Montco and the Rosebud County government to assist Ashland would make a sufficient and timely response to mining's impacts more likely.

Adequate funding for law enforcement would help minimize a variety of potential social impacts, notably traffic accidents stemming from speed and alcohol violations. Providing adequate law enforcement capability would also help deter violence and trespassing. Increased patrol frequency could also alleviate some residents' concern over the presence of newcomers (see Social Conditions).

L. LAND USE

1. Summary of Impacts

The Montco mine would not greatly affect the pattern of land uses in the region. Use of the mine area would temporarily change from grazing to mining. The potential productivity of the reclaimed surface would be somewhat less than its current potential, but actual productivity could well be greater than currently achieved. Because the reclaimed land would support anticipated postmining land uses about as well as at present, the impact of mining would be of little significance.

2. Permit Area

The pattern of postmining land uses would be similar to the premining pattern except that some breaks-type wildlife habitat would be lost (see Wildlife) and a small amount of alfalfa and water impoundment acreage would be gained. (See table IV-2.) Because of unavoidable disruption of the soil, the potential productivity of the reclaimed surface would be slightly lower than the premining condition. This would not affect postmining land use because the actual productivity of the postmining land surface could well be greater than before mining (see Vegetation). Regional agricultural production would not be noticeably reduced by the temporary change in the permit area from agricultural to mining uses.

3. Life-of-Mine Area

About 5,500 acres of the 10,171-acre life-of-mine area would be disturbed over the life of the mine. Almost all of the land that would be disturbed is currently used for grazing; a small part is used for cropland and ranch headquarters.

The pattern of postmining land use would be nearly identical to the premining pattern. The only significant difference would be a slight increase in the number and size of water impoundments, which would be established at

the request of the current landowner. The reduction in potential productivity expected for the permit area would occur in the entire mine plan area. (See Vegetation.) If properly managed, however, the actual productivity of the reclaimed surface would be greater than its current level.

4. Cumulative Scenario

During the 28-year cumulative scenario, about 24,500 acres in addition to those at the Montco mine would be disturbed by mining. Each area disturbed would be removed from agricultural production for an average of 7 years (Interstate Commerce Commission (ICC), 1983, p. A1-22, A1-24). (See chapter I for a description of the cumulative scenario.) About 98 percent of the land that would be disturbed is now used for grazing; the rest is cropland. The loss in agricultural production would reduce agricultural cash receipts by about $1.4 million during the 28-year period, or about 1.8 percent of the total of Rosebud, Powder River, and Custer Counties in 1979 (ICC, 1983, p. A1-25).

About 800 acres of land would be permanently converted from agricultural to urban uses due to the expected expansion in housing, public facilities, and commercial and industrial sites (ICC, 1983, p. A1-26). Land use changes in Colstrip, Forsyth, and Miles City would be compatible with existing uses. In Colstrip, current community development activities associated with the construction of generating units 3 and 4 would accommodate the projected population increases. Miles City and Forsyth are large enough to absorb without disruption the relatively minor land use changes expected. Land use changes in Ashland and Broadus would be relatively greater: population growth would increase the amount of land devoted to urban land uses by about 230 acres in Ashland and 120 acres in Broadus.

5. Tongue River Railroad

Land use impacts of the proposed railroad are discussed in the EIS issued by the Interstate Commerce Commission (ICC, 1983), from which the following summary is drawn.

The Tongue River Railroad would require as many as 1,762 acres for a right-of-way (ICC, 1983, p. A1-2). Of these, 1,435 acres are now used for grazing, 112 for cropland, and the remainder for other uses. Use of an additional 1,062 acres would be lost because the railroad would sever and thus isolate parcels of land too small or irregular to continue in their present use (ICC, 1983, p. A1-6). This would not appreciably affect the ability of ranchers to herd cattle between pastures (ICC, 1983, p. 4-8). Two occupied dwellings, 14 existing or planned irrigation systems, and a few other capital improvements would be displaced or otherwise affected by the railroad.

M. TRANSPORTATION

1. Summary

The Montco mine would noticeably increase traffic on roads in the Ashland area. These roads are currently in need of improvement regardless of whether the mine is built. With those improvements, the roads would carry the increased traffic from the mine without serious problems. The Tongue River Railroad and the mines in the cumulative scenario would cause more serious disruption of traffic.

2. Highways

The largest growth in traffic from the Montco mine, the other mines in the cumulative scenario, and the Tongue River Railroad would occur on the following segments: FAP 39 between Colstrip and Lame Deer, FAP 37 between Lame Deer and Ashland and Ashland to Broadus, FAS 566 between Ashland and the Montco mine, and other secondary roads in the Ashland vicinity, depending on the location of the cumulative scenario mines. These roads would be used by mine workers and by others who moved to the area as a result of the new mines (ICC, 1983, p. A3-33). (See table IV-3.) Traffic increases were projected by adding new work trips and other trips to population increases to the current traffic volumes.

Only about 5 miles of the region's primary highways would require improvements to meet projected traffic increases under the cumulative scenario (ICC, 1983, p. A3-37). This is because much of the region's primary highway system already needs improvement, particularly FAS 37 (U.S. 212) between Lame Deer and Ashland. Maintenance costs during the 28-year period of the cumulative scenario would also increase by about $14 million because of increased traffic (ICC, 1983, p. A3-37).

About 34 miles of unpaved secondary highway would need paving as a result of traffic volume increases. About 6.6 miles of FAS 566 and 6.2 miles of FAS 484 would need to be paved around the turn of the century. At almost $500,000 per mile, secondary highway improvements would cost about $16 million (ICC, 1983, p. A3-39).

About 4 miles of FAS 566 would be temporarily relocated to avoid the loadout loop at Montco and some short sections of the proposed railroad right-of-way. During the life of the mine, an additional 9.5 miles of the road would be relocated.

3. Tongue River Railroad

Coal from the Montco mine would be transported on a new rail line to be built south from the BN mainline at Miles City. Figure IV-8 shows the alignment along the Tongue River which is preferred by the Interstate Commerce Commission. Environmental impacts of the railroad and its alternative alignments are discussed in ICC (1983). Significant effects on highway traffic due to construction of the railroad are not expected. A service road

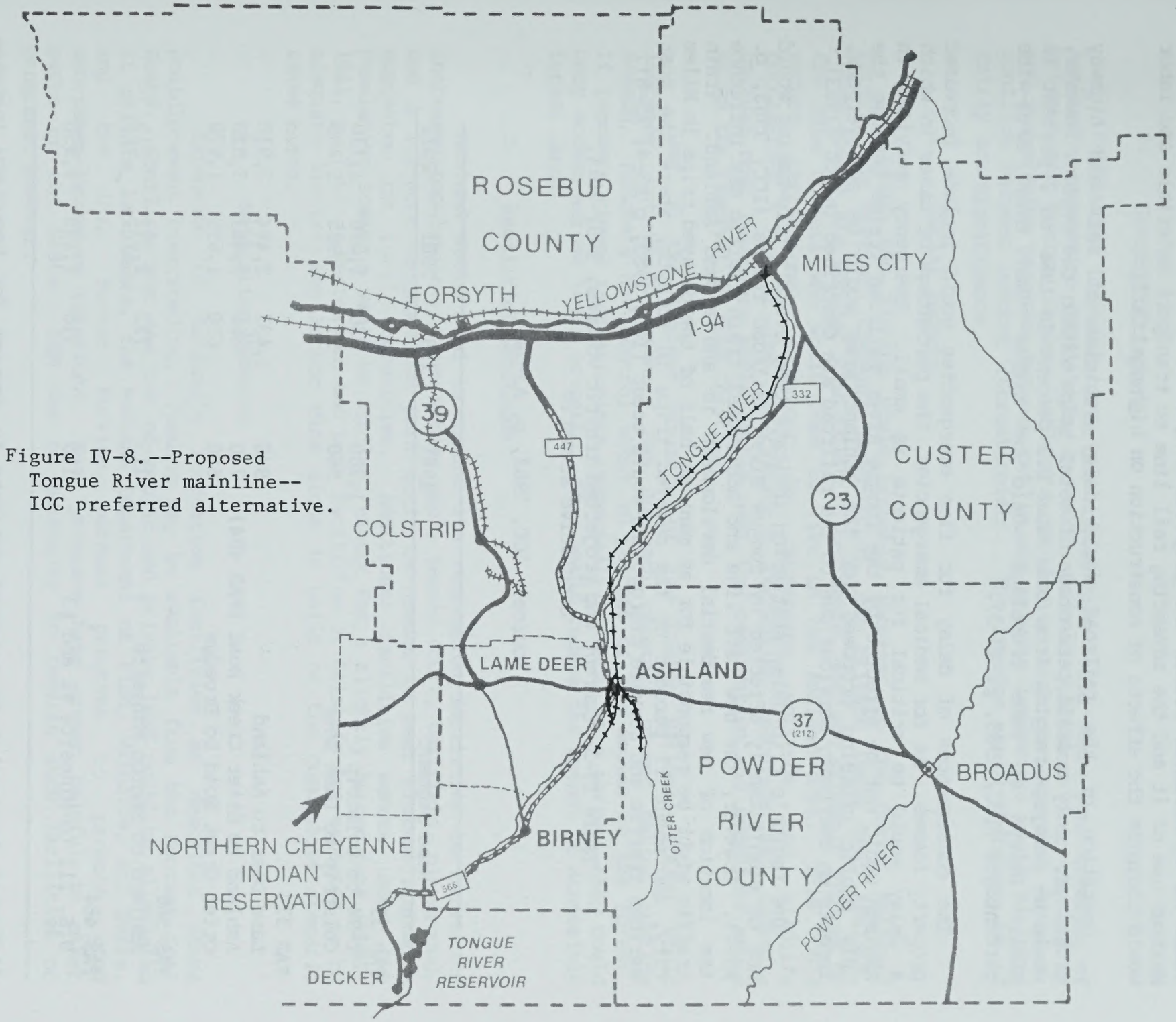

Figure IV-8.--Proposed Tongue River mainline--ICC preferred alternative.

would be established within the proposed Tongue River Railroad right-of-way. Maximum use of it and the advancing rail line to transport materials and labor would minimize the effects of construction on highway traffic.

Operation of the railroad would delay vehicles at rail and highway crossings. Only a small percentage of total trips within the region, however, would be delayed--ranging from less than 0.3 percent in 1986 to 2 percent in 2011. Delays at some crossings would be higher than these area-wide percentages (ICC, 1983, p. A3-3).

The consequences of delay for fire emergencies would include increased property losses. As for medical emergencies, the percentage of cases in which a delay would be critical for patients is small. Emergency services in Ashland would not be affected by the Tongue River Railroad trains because the only public crossing proposed for the Ashland area would be an overpass. Impacts on emergency services due to the railroad are described in ICC (1983).

The region's trip delay statistics indicate that overall trip-making would not be significantly affected by Tongue River Railroad trains (ICC, 1983, p. A3-7). However, the new rail line and additional train traffic may influence the location of new residential development in and around Ashland. Train traffic might be responsible for as many as half of the delayed trips in Miles City, and about 17 percent of the delayed trips in Forsyth, where the most serious traffic and service disruptions would occur (ICC, 1983, p A3-4; A3-8).

Table IV-3--Current and projected traffic volumes, 1981-2011, cumulative scenario

[Source: ICC, 1983, p. A3-34]

Road segment	1981	1991	2001	2011
FAP 39				
I-94 to Colstrip	1,200	830*	1,020*	1,110*
Colstrip to Lame Deer	560	557	985	1,280
FAP 37				
Lame Deer to Ashland	940	1,437	2,484	2,910
Ashland to Otter Creek Road (FAS 484)	740	860	2,481	3,520
Otter Creek Road to Broadus	680	650	1,695	1,970
FAS 566				
Ashland to Montco Minesite	115	722	1,272	215
FAS 484				
U.S. 212 to Minesite #2 and #3	110	110	1,143	1,950

*Adjusted downward from original estimate to account for temporary increase due to construction of Colstrip generating units 3 and 4 during 1981.

N. RECREATION

1. Summary of Impacts

Population increases from the Montco mine would cause some crowding of Ashland's recreation facilities, and would increase conflicts over the use of private and public lands. Ashland's facilities could be expanded, however, and cooperative programs between public and private landowners would minimize conflict between outdoor recreationists. The impacts would therefore be of fairly low significance.

2. Social Impacts

Hunting and fishing would probably increase on the Custer National Forest, the Northern Cheyenne Reservation, and private lands near Ashland. These sports are popular with Colstrip residents, who are probably typical of the mine workers who would come to live in the Ashland area. This could reduce recreational enjoyment by decreasing solitude and wildlife populations. Use of the reservation's recreation resources may increase because most newcomers would settle near the reservation and commuters would cross the reservation from Colstrip.

Use of the Ashland Division of the Custer National Forest would increase, but would probably not approach capacity except during hunting season. Ranchers now control about 90 percent of the access to the forest. If ranchers viewed recreationists (especially hunters) as a threat, they could deny access across their property. This would reduce the amount of accessible forest land.

3. Facilities Shortages

Ashland would need to expand its recreation facilities to serve its increased population. A new wading pool, tennis court, ballfield, playground, and a 1.2-acre neighborhood park would be needed to meet minimum standards suggested for rural communities. Additional facilities needed under the cumulative scenario would be similar, except for a slightly larger park (MWRI, 1981, p. 7-61). Recreation and park facilities at Colstrip are expected to be adequate whether the Montco mine alone is built or the cumulative scenario takes place.

4. Mitigating Measures

Expansion of Ashland's recreation facilities as described above wouldlprevent overcrowding. Funding may be available from the Montana Coal Board. Conflict over the use of public and private land could be alleviated if private landowners, the Montana Department of Fish, Wildlife, and Parks, and the U.S. Forest Service pursued programs to promote good sportsmen-landowner relations. Such programs have proven helpful in other parts of the State. OSM has no authority to require such facilities or programs, however.

O. Cultural Resources

1. Summary of Impacts

Forty-seven of the 64 cultural resource sites, located by various surveys, lie within the life-of-mine boundary. Twenty three of the sites (18 prehistoric, 5 historic) are considered eligible for nomination to the National Register of Historic Places, and twelve of these sites (11 prehistoric, 1 historic) lie within the life-of-mine boundary and are expected to be "directly" impacted by mining operations. Two other historic sites, outside the current boundary of the mine but within a one-mile buffer zone, may be indirectly impacted by mining operations. Montco has submitted a mitigation plan to deal with impacts to eligible sites. The plan will soon be undergoing review by the OSM and has already been reviewed by the Montana Department of State Lands and the Montana State Historic Preservation Office, and its approval is expected.

2. Description of Impacts

Forty of the cultural resource sites have been judged not eligible for listing on the National Register of Historic Places. Field site recordation constitutes all the necessary mitigation for these sites.

Of the 24 sites considered to be eligible, eleven that are prehistoric in nature will be lost in the course of mining. These sites are considered significant for their potential to provide information important to understanding Montana's prehistory. Of the five historic sites eligible for National Register listing, three do not lie within the proposed life-of-mine area but are situated immediately adjacent while a fourth is further removed. The single eligible site which is located in the life-of-mine area falls in an area that may be mined in the future.

The historic sites include abandoned buildings from early homesteads in the area as well as an early day school for Indians on the Northern Cheyenne Reservation. Their deterioration may accelerate from vandalism, theft, arson, or possibly blasting as a result of mining.

Clearly, a number of significant sites, or sites eligible for nominiation to the National Register of Historic Places, will be impacted by coal mining operations at Montco. Ground disturbance, the major source of impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigative measures such as stabilization, restoration, or moving of buildings cause adverse impacts to context, in situ values, and overall integrity. Additionally, loss of sites through necessary mitigation can constitute an adverse impact by eliminating the site from the regional data base and/or affecting its future research potential.

Cultural resources located adjacent to the permit area may be impacted by mining activities as a result of increased population in the general area. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits. Moreover, there is always a possibility that cultural resources inventories based on current technology may not have located all "significant" sites or data within the survey boundaries. Therefore, the potential exists for destroying unknown sites.

Present treatment of cultural resources allows for collection of a portion of the scientific data present at a given site. However, current methodologies, technologies, and priorities may overlook, or find unimportant, sites or data that in the future may be critical to the interpretation of past lifeways. Additionally, the selection of sites for further treatment in lieu of others may cause the loss of important cultural resources.

Beneficial results or impacts may be expected from coal development. Valuable data is being and has been collected by the various surveys. Data that would otherwise not be collected until some time in the near future or lost in the interim is available for study. Mitigation also results in the collection and preservation of data that would likely otherwise be lost.

P. ESTHETICS

1. Summary of Impacts

Impacts on visual resources would be moderately significant during mining, primarily because the mine would be located in an otherwise pastoral setting. The mine facilities and an overburden stockpile would be highly visible from a short segment of the county road during mining. The mine pit would be visible from high points on the Custer National Forest. After reclamation is completed, however, visual impacts would be negligible because the mine facilities would be removed and because the reclaimed areas would be virtually indistinguishable from surrounding unmined areas. Noise from the mine would be of relatively little significance because few people live close to the mine.

2. Impacts During Mining

Mining in both the permit area and the life-of-mine area would cause a marked change from a rural to an industrial setting. Within the permit area (the North King mining unit), an overburden stockpile, the mine facilities, and the railroad loop would be visible from the county road (FAS 566). Of these, the overburden stockpile would be most prominent owing to its height and its location above the road. The mine facilities would be highly visible from a short (about 1/4 mile) segment of the road closest to the facilities. From other parts of the road, the facilities would mostly be screened from view by low hills. The mine pit would not be visible from the county road because of topographic screening; it would, however, be noticeable to those who visited high points in the Custer National Forest east of the mine, and to the occasional visitors to high points west of the mine, across the Tongue River on the Northern Cheyenne Reservation. Dust from overburden removal, blasting, and vehicles would be locally noticeable.

Odors from vehicle emissions would partially replace natural odors, predominantly the smell of vegetation. The sounds of mining--haul trucks, trains, drilling, blasting, conveyors, and crushers--would pervade the formerly quiet rural area.

According to the EIS on the proposed Tongue River Railroad (Interstate Commerce Commission, 1983, p. 4-41), noise from trains could be aggravating to some residents in rural areas along the right-of-way, but would not pose a significant health hazard. Noise from trains would interfere with some outdoor activities in Ashland when trains passed by. Additional mines developed under the cumulative scenario would cause only localized impacts, according to the ICC.

These sights and sounds would contrast sharply with the surrounding rural, agricultural setting, and would reduce the existing esthetic quality of the area during mining. Because they would be visible only to the relatively few people using the county road and nearby public and reservation lands (as opposed to, say, a densely populated urban area), these impacts would be moderately significant during mining. These impacts could not reasonably be avoided if the mine were approved.

3. Impacts Following Mining

Visual and auditory impacts would mostly end with the completion of mining and reclamation in the permit area, but would continue in similar fashion in the rest of the life-of-mine area until all mining and reclamation was completed.

After reclamation, most of the visual impacts that occurred during mining would cease. Assuming successful reclamation (see Vegetation), the permit area would return to a condition similar to its premining appearance and to the appearance of surrounding unmined lands. The reclaimed landscape would approximate the premining contour (see Geology). The mine facilities, the railroad loop, and the powerline would be removed. The mine pit, soil and overburden stockpiles, and other disturbed areas would be regraded and revegetated with species approximating the premining condition. This would minimize visual contrast with surrounding unmined lands.

On the north and east edges of the permit area, the proposed postmining vegetation would be shrub and grassland--the same as before mining. Montco would plant grasses using two passes of the seed drill instead of one pass, which would minimize the artificial, row-like appearance that could otherwise result for the first few years of reclamation.

On the southern edge of the mined area, the existing ponderosa pine would be removed, and would take decades to regrow from the seedlings Montco would plant. This would not create obvious visual contrasts because the existing pine stands do not form a continuous forest cover. Further, the southern edge would be screened from view from below, on King Creek, by the low ridge that rises north of the creek.

Initial reclamation would probably be noticeable from high points on the Custer National Forest east of the mine and would present a moderate contrast in color and texture to surrounding mined land. However, relatively few people use these vantage points. In a decade or so following mining and reclamation, revegetated areas would generally not be noticeable to untrained observers. (This assumes successful revegetation; a severe drought could cause noticeable patches of bare or sparsely vegetated ground.)

Because of the low visual contrast of the reclaimed mine area with surrounding land, long-term esthetic impacts (10 years or more following initial reclamation) would be negligible and of little significance to the overall esthetic quality of the area.

Esthetic impacts from development associated with the Montco mine, including the Tongue River Railroad and possible other mines along the railroad, are examined in a separate EIS (Interstate Commerce Commission, 1983). That EIS predicts significant visual impacts for only a few miles of the proposed rail line and low or very low impacts along 93 percent of the rail line. Visual impacts from other possible mines along the rail line were not examined in detail, owing to the lack of specific plans, but could be expected to be similar to those of the Montco mine.

Q. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section briefly discusses the resources that would be lost to future use as a result of mining. It is based on the more detailed impact analyses found in this chapter. Resources that would be affected only temporarily (that is, during the life of the mine or a few years following final reclamation) are not discussed here.

Over the 24-year life of the mine, 186.1 million tons of coal would be mined from about 5,000 acres; 27.8 million tons of coal would not be recovered, owing to the limitations of present technology. The coal that would be mined represents less than 1 percent of the estimated 32 billion tons of strippable coal in the northern Powder River basin (U.S. Department of the Interior and Montana Department of State Lands, 1979, p. VII-1). About 25.5 million tons of coal would be mined from about 500 acres in the 5-year permit area.

The mine would use an average of about 400 acre-feet of water per year. About 170 acre-feet would be pumped from the Hell Creek aquifer; the remainder would be pumped from the Tongue River. Most of this water would be lost to evaporation and therefore would not be available for other uses; however, neither the Tongue River nor the Hell Creek aquifer would be appreciably diminished by such use. Population growth associated with the mine would require about 240 acre-feet per year on the average; some of this water would be returned to the hydrologic system.

Ground water that passed through the mine spoils would be of poorer quality than existed in the overburden and coal aquifers before mining. This impact would continue for the indefinite future--at least several centuries. Much of this water, however, is presently of poor quality and cannot be used for irrigation, livestock watering, or human consumption. The McKelvey spring is anticipated to go dry and may not resume flow when the postmining ground water system is reestablished. However, other sources of ground and surface water are available for stock watering and other uses. In addition, Montco would be required by law to replace any wells removed or severely affected by mining. Slightly more electricity would probably be needed to pump the ground water from deeper depths; the cost of this would probably be borne by the postmining land user.

The mine would use about 150 million gallons of diesel fuel, 90 million pounds of ammonium nitrate-fuel oil explosive, and 1 million kilowatt-hours of electricity over its 24-year life, based on data in Montco's permit application. This is comparable to energy consumption rates at other surface mines in the northern Great Plains, for equivalent tonnages of coal mined. This energy use represents about 1 percent of the energy recovered from the coal at the power plant. Rail shipment of the coal could add substantially to this percentage, depending on the destination of the coal, which is not known. Assuming that the coal were hauled 1,000 miles with a net fuel efficiency of 300 ton-miles per gallon, it would take 620 million gallons of diesel fuel to ship the coal to the power plant. Total direct energy consumption, including fuel used in transportation and at the mine, would be about 3 percent of the energy value of the coal. This does not include the indirect energy used to manufacture mine machinery, house and transport workers, and similar indirect uses, which would increase this proportion further.

New housing would remove about 800 acres of land from agricultural and wildlife uses, mostly in the Ashland area. In addition, the proposed Tongue River Railroad mainline would remove from production 3,045 acres of land now used primarily for agriculture. Other effects of the proposed railroad on land uses are discussed in the ICC EIS (Interstate Commerce Commission, 1983).

Mining and construction could be expected to cause about 330 accidents over the life of the mine, including perhaps 1 or 2 fatal accidents. About 80 additional traffic accidents could be expected from population increases attributable to the mine and from operation of the Tongue River Railroad. These accidents would result in perhaps 40 injuries and one death, based on current accident rates in similar areas.

Twelve prehistoric sites and one historic site eligible for the National Register of Historic Places would be destroyed over the life of the mine. Although these sites would be excavated, recorded, and analyzed prior to mining, thus preserving most of the information they contain, the opportunity for further study and their intrinsic in-place value would be lost. Four additional sites--three historic and one prehistoric--could be irreversibly damaged by indirect effects of mining, such as vandalism, amateur collecting, and blasting.

R. SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY OF THE LANDS AFFECTED BY MINING

This section compares the resources--such as coal and taxes--that would be produced by the mine with the long term effect on the productivity of the reclaimed mined lands.

Coal from the Montco mine would produce electricity and considerable tax revenues, royalties, and jobs. This would be achieved at a cost of short term vegetative, wildlife, and livestock productivity at and near the minesite. Long term productivity of the land surface, however, would be only minimally reduced by mining.

The coal produced from the mine would probably be burned for electrical power in the upper Midwest or the Pacific Northwest, although Montco has not yet found a market. From 1986 through 2006, Montco would pay an estimated $483 million in State taxes, $111 million in State royalties, and $250 million in Federal taxes and fees. (Federal taxes and fees would not increase net Federal receipts, assuming an equal amount of coal would be mined elsewhere if the Montco mine were not developed.) Increased revenues from local property taxes would make it easier for local school districts and Rosebud County to finance their operations, although revenue shortfalls would occur in Powder River County. (See Economic Conditions.)

Reductions in long-term productivity would be minimal. Maximum potential vegetative productivity of the reclaimed land would probably not be as high after mining as what could have been achieved prior to mining under optimum management. The slight reduction that would occur could last for several decades or longer, caused by unavoidable impacts on soils, such as loss of structure, organic matter, soil profile, and pore continuity. The actual productivity of the reclaimed land would probably be about as high as at present--about half its potential productivity. Thus the reclaimed land probably would support the anticipated postmining use for livestock grazing about as well as at present, although the land would be more sensitive to mismanagement and drought. (See Soils and Vegetation.) The existing ponderosa pine and juniper would take decades to fully reestablish, and perhaps centuries to grow to maturity. This would reduce habitat for wildlife species that used those trees--principally mule deer and various bird species. (See Wildlife.) Ground water quality would be reduced, but not so much as to affect agricultural or human uses. (See Hydrology.)

CHAPTER V

PUBLIC PARTICIPATION, CONSULTATION, AND COORDINATION

A notice of intent to prepare this draft environmental impact statement (EIS) was published in the Federal Register on December 12, 1983 (48 FR 55343). This EIS was then prepared under the direction of the Office of Surface Mining (OSM), U.S. Department of the Interior, by an interdisciplinary task force (Chapter VI) in consultation with technical specialists.

In the Federal Register notice, OSM requested written comments or statements on the scope of the EIS. Two written comments were received and aided in establishing the scope of the EIS. No scoping meetings were held because Montana's draft EIS on the proposed Montco mine had already been subject to extensive public review and comment during the scoping period. The public and all interested Federal, State, and local agencies and Indian tribes will have an opportunity to submit written comments on this draft EIS during the public comment period. In addition, a public hearing will be held in Ashland, Montana, to receive oral testimony on this environmental impact statement.

Copies of this EIS are available to the public for their comments and suggestions. In addition, comments are being solicited from the following:

DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs (Billings, Mont.)
Bureau of Land Management (Billings, Mont., Miles City, Mont., and Denver, Colo.)
Bureau of Mines (Denver, Colo.)
Fish and Wildlife Service (Billings, Mont.)
Geological Survey (Helena, Mont., and Denver, Colo.)
Minerals Management Service (North Central Region, Casper, Wyo.)

OTHER FEDERAL AGENCIES

Department of Agriculture
Forest Service (Missoula, Mont.)
Forest Service: Custer National Forest (Ashland and Billings, Mont.)
Department of Energy: Bonneville Power Administration (Portland, Oreg.)
Department of Health and Human Services (Denver, Colo.)
Environmental Protection Agency (Helena, Mont., and Denver, Colo.)
Interstate Commerce Commission (Washington, D.C.)

STATE AND LOCAL AGENCIES AND INDIAN TRIBES

Custer County Planning Office (Miles City, Mont.)
Montana Department of Fish and Game (Helena and Miles City, Mont.)
Montana Department of Health and Environmental Sciences (Helena, Mont.)
Montana Department of Highways (Helena, Mont.)
Montana Department of Natural Resources and Conservation (Helena, Mont.)

Montana Department of Social and Rehabilitation Services (Helena, Mont.)
Montana Department of State Lands (Helena, Mont.)
Montana Historical Society (Helena, Mont.)
Northern Cheyenne Indian Tribe (Lame Deer, Mont.)
Powder River County Planning Office (Broadus, Mont.)
Rosebud County Planning Office (Forsyth, Mont.)

APPLICANT

Montco partnership

ORGANIZATIONS, ASSOCIATIONS, AND MISCELLANEOUS ENTITIES

Billings Chamber of Commerce (Billings, Mont.)
Environmental Policy Institute (Washington, D.C.)
Historical Research Associates (Missoula, Mont.)
Montana Association of Counties (Helena, Mont.)
Montana Chamber of Commerce (Helena, Mont.)
Montana Coal Council (Helena, Mont.)
Montana Environmental Quality Council (Helena, Mont.)
Montana International Trade Commission (Helena, Mont.)
Montana League of Cities and Towns (Helena, Mont.)
Montana Railroad Association (Helena, Mont.)
Montana State Council of Carpenters (Helena, Mont.
Montana State University: Department of Sociology (Bozeman, Mont.)
Montana Wilderness Association (Helena, Mont.)
Montana Wildlife Federation (Helena, Mont.)
Northern Plains Resource Council (Billings, Mont.)
Northern Rockies Action Group, Inc. (Helena, Mont.)
Patten and Renz (Billings, Mont.)
Powder River Associates (Broadus, Mont.)
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Powder River Protective Association (Broadus, Mont.)
Rosebud Protection Association (Forsyth, Mont.)
Sunlight Development Corporation (Colstrip, Mont.)
Tongue River Agriculture Protective Association (Miles City, Mont.)
Tongue River Railroad Company (Billings, Mont.)
Tongue River Water Users Association (Ashland, Mont.)
Tri-County Ranchers Association (Birney, Mont.)
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CHAPTER VII

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APPENDIXES 1-5

APPENDIX 1

Species for revegetation on the Montco life-of-mine area

[From MDSL, 1982d, appendix 1]

APPENDIX 1--Species for Revegetation on the Montco Area

Species	Preferred Variety	Primary Locations On Site	Soil Adaptation	Tolerance to Salinity/ Alkalinity	Wildlife Value	Palata-bility to Cattle	Method of Establish-ment	Area of Establish-ment**
GRASSES								
Big bluegrass (Poa ampla)	Sherman	Not common	Best on medium	Poor to fair	Minor food and cover	Good	Seed	2,4
Blue grama (Bouteloua gracilis)	Lovington	Uplands; clay-silty loams	All; best on medium to fine	Poor to fair	Minor food and cover	Good	Seed	2,4
* Bluebunch wheatgrass (Agropyron spicatum)	Whitmar	Not Present	Best on medium to fine	Poor to fair	Minor food and cover	Good	Seed	1,2,3
Buffalograss (Buchloe dactyloides)	--	Not present	Best on medium to clayey	Poor to fair	Moderate food; minor cover	Good	Seed	1,2,3,4
Green needlegrass (Stipa viridula)	Lodorm	Upland drain-ages; clay-silt loams	Best on medium to fine	Poor to fair	Minor food and cover	Good	Seed	1,2,4
Indian ricegrass (Oryzopsis hymenoides)	Paloma	Badlands, slopes; coarse, stoney soils	Best on sandy to medium	Poor to fair	Moderate food; minor cover	Good	Seed	3
Little bluestem (Schizachyrium scoparius)	Adlous, Blaze	Slopes; coarse soils	All; best on sandy to medium	Poor	Minor food and cover	Fair	Seed	3
Needle-and-thread (Stipa comata)	--	Uplands, slopes; coarse soils	Best on sandy to medium	Poor to fair	Minor food and cover	Good	Seed	3
Prairie sandreed (Calamovilfa longifolia)	Goshen	Sidehills, breaks; coarse	All; best on sandy to medium	Poor	Moderate food; minor cover	Fair	Seed	3
Sideoats grama (Bouteloua curtipendula)	Vaughn, Pierre	Slopes; coarse soils	All; best on sandy to medium	Poor to fair	Minor food and cover	Good	Seed	1,2,3,4
Slender wheatgrass (Agropyron trachycaulum)	Primar	Not present	All; best on medium to fine	Fair to good	Minor food and cover	Good	Seed	S
Streambank wheatgrass (Agropyron riparium)	Sodar	Not present	All; best on medium	Fair to good	Minor food and cover	Good	Seed	2,4,5,S

* Should be beardless wheatgrass (Agropyron inerme).

APPENDIX 1--Species For Revegetation on the Montco Permit Area
(Continued)

Species	Preferred Variety	Primary Locations On Site	Soil Adaptation	Tolerance to Salinity/ Alkalinity	Wildlife Value	Palata-bility To Cattle	Method of Establish-ment	Area of Establish-ment**
Thickspike wheatgrass (Agropyron dasystachyum)	Critana	Uplands; clay-silt loams	Best on medium to fine	Fair to good	Minor food and cover	Good	Seed	1,2,3,4,5,S
Western wheatgrass (Agropyron smithii)	Rosana	Uplands, drain-ages, slopes; clay-silt loams, coarse soils	Best on medium to fine	Good	Minor food and cover	Good	Seed	1,2,4,5,S
FORBS								
Arrowleaf balsamroot (Balsamorhiza sagittata)	--	Slopes; coarse soils	Best on medium	Poor	High food; moderate cover	Fair	Seed	1
Cicer milkvetch (Astragalus cicer)	Lutana	Not present	All; best on medium to clayey	Fair	High food; minor cover	Good	Seed	2,3,4
Fringed sagewort (Artemisia frigida)	--	Uplands, slopes; coarse soils	All; best on medium	Poor	Moderate food; moder-ate cover	Poor	Seed	1,2,4
Lewis flax (Linum lewisii)	--	Widely distri-buted; variable soils	Best on medium	Poor	Moderate food; minor cover	Fair	Seed	1,3
Purple prairie clover (Petalostemon purpureum)	--	Uplands, slopes; coarse soils	All; best on shallow soils	Poor	High food; minor cover	Fair	Seed	1,3
Scarlet globemallow (Sphaeralcea coccinea)	--	Lowlands; clayey soils	All	Fair	Moderate food; minor cover	Fair	Seed	2,4
Yarrow (Achillea millifolium)	--	Slopes; coarse soils, silt loams	All; best on sandy and medium	Poor	High food; minor cover	Poor	Seed	1,3
SHRUBS/TREES								
Big sagebrush (Artemisia tridentata)	--	Uplands, bad-lands, clay-silt loams, coarse loams	Coarse to fine	Fair	Moderate food; high cover	Fair to Poor	Seed, Seedlings	1,2,4
Buffaloberry (Sheperdia argentea)	--	Drainageways	All; best on medium	Poor	High food and cover	Poor	Seedlings	5

Species	Preferred Variety	Primary Locations On Site	Soil Adaptation	Tolerance to Salinity/ Alkalinity	Wildlife Value	Palata-bility To Cattle	Method of Establish-ment	Area of Establish-ment**
Chokecherry (*Prunus virginiana*)	--	Drainageways	All; best on medium	Poor	High food and cover	Poor	Seedlings	5
Common snowberry (*Symphoricarpos albus*)	--	Drainageways	Best on medium	Poor	High food and cover	Fair	Seedlings	5
Common winterfat (*Ceratoides lanata*)	--	Uplands; clay-silt loams	All; best on medium to fine	Good	High food; minor cover	Fair	Seed	4
Fourwing saltbush (*Artiplex canescens*)	Wytana	Uplands	Coarse to medium	Good	High food; high cover	Fair	Seed, Seedlings	2,3
Ponderosa pine (*Pinus ponderosa*)	--	Slopes; very coarse soils, silt loams	All	Fair	Minor food; high cover	Poor	Seed, Seedlings transplants	1
Rocky Mountain juniper (*Juniperus scopulorum*)	--	Badlands, slopes; very coarse soils, silt loams	All best on medium to sandy	Fair to Good	Moderate food; high cover	Poor	Seed, Seedlings, transplants	1,5
Rubber Rabbitbrush (*Chrysothamnus nauseosus*)	--	Uplands, slopes, badlands	Coarse to medium	Fair	Moderate food; moder-ate cover	Poor	Seed	1
Silver sagebrush (*Artemisia cana*)	--	Lowland, stream courses	All, best on medium	Poor	Moderate food; high cover	Fair	Seedlings	5
Skunkbush sumac (*Rhus trilobata*)	--	Slopes, coarse soils	Coarse to medium	Poor	Moderate food; high cover	Poor	Seedlings	1,3,5
Woods Rose (*Rosa woodsii*)	--	Lowlands, coulees	Best on sandy to medium	Poor	High food; high cover	Fair	Seedlings	3,5

**Postmining areas:
1 = ponderosa pine/juniper
2 = big sagebrush/grassland
3 = sidehill bunchgrass
4 = sod-forming grassland
5 = drainageways
S = soil stockpile

APPENDIX 2
Table 1.--Avian species observed on the Montco Wildlife Study Area, 1978-1982
[Modified from MDSL(1982d, appendix 2)]

Common name	Scientific name
American coot	Fulica americana
eared grebe	Podiceps nigricollis
double-crested cormorant	Phalacrocorax auritus
great blue heron	Ardea herodias
snowy egret	Leucophoyx thula
Canada goose	Branta canadensis
mallard	Anas platrhynchos
gadwall	Anas strepera
pintail	Anas acuta
green-winged teal	Anas crecca
blue-winged teal	Anas discors
American widgeon	Anas americana
northern shoveler	Anas clypeata
ruddy duck	Oxyura jamaicensis
wood duck	Aix sponsa
redhead	Aythya americana
ring-necked duck	Aythya collaris
lesser scaup	Aythya affinis
common goldeneye	Bucephala clangula
bufflehead	Burcephala albeola
hooded merganser	Lophodytes cucullatus
common merganser	Mergus merganser
turkey vulture	Cathartes aura
goshawk	Accipter gentilis
sharp-shinned hawk	Accipiter striatus
Cooper's hawk	Accipiter cooperii
red-tailed hawk	Buteo jamaicensis
Swainson's hawk	Buteo swainsoni
rough-legged hawk	Buteo lagopus
ferruginous hawk	Buteo regalis
golden eagle	Aquila chrysaetos
bald eagle	Haliaeetus leucocephalus
marsh hawk	Circus cyaneus
osprey	Pandion haliaetus
gyrfalcon	Falco rusticolus
prairie falcon	Falco mexicanus
peregrine falcon	Falco peregrinus
merlin	Falco columbarius
American kestrel	Falco sparverius
sharp-tailed grouse	Pediocectes phasianellus
sage grouse	Centrocercus urophasianus
ring-necked pheasant	Phasianus colchicus
red crossbill	Loxia curvirostra
Clark's nutcracker	Nurifraga columbiana
brown creeper	Certhia familiaris
golden-crowned kinglet	Regulus satrapa
ovenbird	Seiurus aurocapillus
snow bunting	Plectrophenax nivalis

APPENDIX 2

Table 1.--Avian species observed on the Montco Wildlife Study Area, 1978-1982--Continued

Common name	Scientific name
gray partridge	Perdix perdix
Merriam's turkey	Meleagris gallopavo
sandhill crane	Grus canadensis
sora	Porzana carolina
killdeer	Charadrius vociferus
common snipe	Capella gallinago
upland sandpiper	Bartramia longicauda
least sandpiper	Erolia minutilla
spotted sandpiper	Actitis macularia
solitary sandpiper	Tringa solitaria
willet	Catoptrophorus semipalmatus
greater yellowlegs	Totanus melanoleucus
Western sandpiper	Ereunetes mauri
American avocet	Recurvirostra americana
Wilson's phalarope	Steganopus tricolor
ring-billed gull	Larus delawarensis
Franklin's gull	Larus pipixcan
mourning dove	Zenaidura macroura
rock dove	Columbia livia
black-billed cuckoo	Coccyzus erythropthalmus
long-eared owl	Asio outus
screech owl	Otus asio
great horned owl	Bubo virginianus
burrowing owl	Speotyto cunicularia
short-eared owl	Asio flammeus
poor-will	Phalaneoptilus nuttallii
common nighthawk	Chordeiles minor
chimney swift	Chaetura pelagica
white-throated swift	Aeronautes saxatalis
belted kingfisher	Megaceryle alcyon
common flicker	Colaptes auratus
red-headed woodpecker	Melanerpes erythrocephalus
yellow-bellied sapsucker	Sphyrapicus varius
hairy woodpecker	Dendrocopos villosus
downy woodpecker	Dendrocopos pubescens
Eastern kingbird	Tyrannus tyrannus
Western kingbird	Tyrannus verticalis
Say's phoebe	Sayornis saya
least flycatcher	Empidonax minimus
Western wood pewee	Contopus sordidulus
horned lark	Eremophila alpestris
violet-green swallow	Tachycineta thalassina
tree swallow	Tridiprocne bicolor
bank swallow	Riparia riparia
rough-winged swallow	Stelgidopteryx ruficollis
barn swallow	Hirundo rustica
cliff swallow	Petrochelidon pyrrhonota
black-billed magpie	Pica pica
common crow	Corvus brachyrhynchos

APPENDIX 2
Table 1.--Avian species observed on the Montco Wildlife Study Area, 1978-1982--Continued

Common name	Scientific name
pinyon jay	Gymnorhinus cyanocephala
black-capped chickadee	Parus articapillus
white-breasted nuthatch	Sitta carolinesis
red-breasted nuthatch	Sitta canadensis
house wren	Troglodytes aedon
canon wren	Catherpes mexicanus
rock wren	Salpinctes obsoletus
gray catbird	Dumetella carolinesis
brown thrasher	Toxostoma rufum
sage thrasher	Oreoscoptes montanus
American robin	Turdus migratorius
veery	Hylocichla fusecens
Western bluebird	Sialia mexicana
mountain bluebird	Sialia currucoides
Townsend's solitaire	Myadestes townsendi
water pipit	Motacilla spinoletta
Bohemian waxwing	Bombycilla gerrula
cedar waxwing	Bombycilla cedrorum
Northern shrike	Lanius excubitor
loggerhead shrike	Lanius ludoricianus
starling	Sturnus vulgaris
warbling vireo	Vireo gilvas
solitary vireo	Vireo solitarius
red-eyed vireo	Vireo olivaceus
yellow warbler	Dendroica petechia
yellow-rumped warbler	
common yellowthroat	Geothlypis trichas
yellow-breasted chat	Icteria virens
American redstart	Setophaga ruticilla
house sparrow	Passer domesticus
Western meadowlark	Sturnella neglecta
yellow-headed blackbird	Xanthocephalus xanthocephalus
red-winged blackbird	Agelaius phoeniceus
Northern oriole	Iceterus galbula
Brewer's blackbird	Euphagus cyanocephalus
common grackle	Quiscalus guiscula
brown-headed cowbird	Molothrus ater
black-headed grosbeak	Pheucticus melanocephalus
lazuli bunting	Passerina amoena
pine grosbeak	Punicola enucleator
evening grosbeak	Hesperiphona vespertina
gray-crowned rosy finch	Leucosticte tephrocotis
common redpoll	Acanthis flammea
pine siskin	Spinus pinus
American goldfinch	Spinus tristis
rufus-sided towhee	Pipilo erythrophthlamus
lark bunting	Calamospiza melanocorys
Savannah sparrow	Passerculus sandwichensis

APPENDIX 2

Table 1.--Avian species observed on the Montco Wildlife Study Area, 1978-1982--Continued

Common name	Scientific name
grasshopper sparrow	Ammodramus savannarum
vesper sparrow	Pooecates gramineus
lark sparrow	Chondestes grammacus
dark-eyed junco	Junco hyemalis
tree sparrow	Spizella arborea
chipping sparrow	Spizella passerina
Brewer's sparrow	Spizella breweri
white-crowned sparrow	Zonotrichia leucophrys
fox sparrow	Passerella iliaca
song sparrow	Melospiza melodia

APPENDIX 2

Table 2.--Common birds seen on vehicle, point, and belt transects, Montco Wildlife Study Area, May and June 1980

[From MDSL (1982d, Chap. II, Table II-14)]

Species	Average numbers observed
Vehicle route transect	
Western meadowlark	160.3
Brewer's blackbird	100.7
lark sparrow	48.3
lark bunting	45.7
Brewer's sparrow	21.3
mourning dove	20.7
robin	19.0
yellow warbler	12.7
vesper sparrow	10.3
King Creek - Ponderosa pine/Juniper	
chipping sparrow	21.7
lark sparrow	15.0
yellow-rumped warbler	8.0
rufous-sided towhee	7.0
Western kingbird	6.7
brown-headed cowbird	5.0
robin	3.3
house wren	3.3
mourning dove	2.3
Dry Creek - Ponderosa pine/Juniper	
chipping sparrow	26.3
lark sparrow	13.7
Western meadowlark	10.0
yellow-rumped warbler	7.0
brown-headed cowbird	5.7
rufous-sided towhee	5.3
Western kingbird	4.7
Western wood peewee	4.7
mourning dove	3.0
house wren	3.0

APPENDIX 2

Table 2.--Common birds seen on vehicle, point, and belt transects, Montco Wildlife Study Area, May and June 1980--Continued

Species	Average numbers observed
McKelvey-King Creek riparian	
mourning dove	22.0
common grackle	19.0
house wren	17.3
yellow warbler	17.0
American robin	10.7
Western kingbird	10.7
tree swallow	9.0
yellow-breasted chat	6.3
red-winged blackbird	5.7
least flycatcher	4.7
N. O'Dell Creek - Big sagebrush/Grassland	
Brewer's sparrow	17.67
meadowlark	6.00
lark Sparrow	9.67
vesper sparrow	1.00
mouring dove	0.34
rufous-sided towhee	1.00
common flicker.	0.34
American goldfinch	0.67
sharp-tailed grouse	1.34
N. King Creek - Big sage/Grassland	
Brewer's sparrow	8.00
lark sparrow	3.67
meadowlark	4.00
sharp-tailed grouse	0.34
vesper sparrow	1.67
Western kingbird	0.34
chipping sparrow	1.34
mountain bluebird	0.34
common flicker	0.34

APPENDIX 3

Table 1.--Mammalian species observed on the Montco Wildlife Study Area, July 1978-August 1979
[From MDSL (1982d, appendix 3)]

Common name	Scientific name
masked shrew	Sorex cinereus
little brown myotis	Myotis lucifugus
white-tailed jackrabbit	Lepus townsendii
desert cottontail	Sylvilagus auduboni
thirteen-lined ground squirrel	Spermophilus tridecemlineatus
black-tailed prairie dog	Cynomys ludovicianus
least chipmunk	Eutamias minimus
red squirrel	Tamiasciurus hudsonicus
northern pocket gopher	Thomomys talpoides
olive-backed pocket mouse	Perognathus fasciatus
Ord kangaroo rat	Dipolomys ordii
beaver	Castor canadensis
Western harvest mouse	Reithrodonotomys megalotis
deer mouse	Peromyscus maniculatus
white-footed mouse	Peromyscus leucopus
bushy-tailed wood rat	Neotoma cinerea
meadow vole	Microtus pennsylvanicus
prairie vole	Microtus ochrogaster
sagebrush vole	Lagurus curtatus
muskrat	Ondatra zibethicas
meadow jumping mouse	Zapus hudsonius
house mouse	Mus musculus
porcupine	Erethizon dorsatum
long-tailed weasel	Mustela frenata
mink	Mustela vison
striped skunk	Mephites mephites
badger	Taxidea taxus
raccoon	Procyon lotor
red fox	Vulpes vulpes
coyote	Canis latrans
bobcat	Lynx rufus
white-tailed deer	Odocoileus virginianus
mule deer	Odocoileus hemionus
pronghorn	Antilocapra americana

APPENDIX 3

Table 2.--Relative abundance of eight species of small mammals, expressed as percent of captures
[From MDSL (1982d, Chap. II, Table II-15)]

Species	Fall 1979		Spring 1979	
	Number	Percent	Number	Percent
deer mouse	121	85.2	70	88.6
white-footed mouse	5	3.5	1	1.3
Western harvest mouse	1	0.7	5	6.3
least chipmunk	12	8.5	2	10.7
prairie vole	1	0.7	0	0
Ord kangaroo rat	1	0.7	0	0
olive-backed pocket mouse	1	0.7	0	0
thirteen-lined ground squirrel	0	0	1	1.3
Total	142	100.0	79	100.0

APPENDIX 4

Reptiles and amphibians observed on the Montco Wildlife Study Area, July 1978-August 1979
[From MDSL (1982d, appendix 4)]

Common name	Scientific name
reptiles	
snapping turtle	Chelydra serpentina
spring softshell	Trionyx spiniferus
sagebrush lizard	Sceloporus graciosus
racer	Coluber constrictor
gopher snake	Pituophis melanoleucus
plains garter snake	Thamnophis radix
Western rattlesnake	Crotalus viridis
amphibians	
tiger salamander	Ambystoma tigrinum
Woodhouse's toad	Bufo woodhousei
chorus frog	Pseudacris triseriata
leopard frog	Rana pipiens

IN REPLY REFER TO:
3400 (921)

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
222 North 32nd Street
P.O. Box 30157
Billings, Montana 59107

January 6, 1984

Dr. Mark Boster, Acting Chief
Division of Environmental &
Economic Analysis
Office of Surface Mining
1951 Constitution Avenue, N.W.
Washington, D.C. 20240

Dear Dr. Boster:

The Bureau of Land Management has been requested by Montco to make a determination on the suitability of their permit area mine plan in respect to jeopardizing recovery of Federal coal in the area.

The permit area encompasses most of sec. 8, T. 4 S., R. 44 E. and a small part of sec. 7 and 18. In this area, the Knobloch bed was the main coal bed present. It is extensively burned, but there are small unburned remnants in the N½NE¼, the SE¼SE¼, and near the central part of sec. 8 (See U.S. Geol. Survey Bull. 1072-J, pl. 19 W½ and pl. 21). The remnants in the N½NE¼ and the SE¼SE¼ are not near the loading and hauling facilities and would not be jeopardized by them.

The unburned remnant of the Knobloch bed near the center of the section underlies approximately 10 acres of land, is in excess of 24 feet thick (Bull. 1072-J, p. 571) and has shallow overburden. There are about 400,000 tons of coal in this remnant. The maximum overburden is probably less than 30 feet and therefore the coal might be weathered. Proposed facilities surround this area, but would not jeopardize the coal.

Because of the close proximity of loading facilities, this Knobloch coal is more likely to be mined than if the proposed facilities were built farther away. It is therefore concluded that the permit area mine plan as proposed would not interfere with the future development of the Knobloch bed.

The Flowers-Goodale bed may extend beneath this land, but it tends to be lenticular in this area. A mile away it is 8 feet thick and is about 220 feet beneath the Knobloch. The average stripping ratio therefore would probably exceed 20 to 1, making it economically infeasible to mine by surface methods.

It is also highly unlikely in the foreseeable future that the deposit would be recovered by underground methods due to economics and its location in relationship to the Tongue River.

Sincerely yours,

Donald L. Gilchrist, Act. Chief
Branch of Solid Minerals

cc: Dennis Hemmer, Commissioner,
Dept. State Lands, Helena, MT

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

Form 1279-3
(June 1984)
BORROWE
TD 195 .C58 M664 1984
Proposed Montco Mine,
Rosebud County, Monta
DATE LOANED
BORROWER
USDI – BLM

U.S. DEPARTMENT OF THE INTERIOR
March 3, 1849